ROCK PRODUCTS

Golden Anniversary Issue

JUNE 1946

Fifty years of Industry Progress
and what it denotes for the future

1896 1946



Just Look What Happens
When You Close Your Grinding Circuit
with this

BIRD CLASSIFIER

407,000 Tons In Two Years With Nary a Shutdown for Maintenance

That is the record of one Bird Classifier. Running continuously it has handled that much rock without being dismantled once.

It takes the slurry at mill consistency and with the clay already added to the feed, if desired.

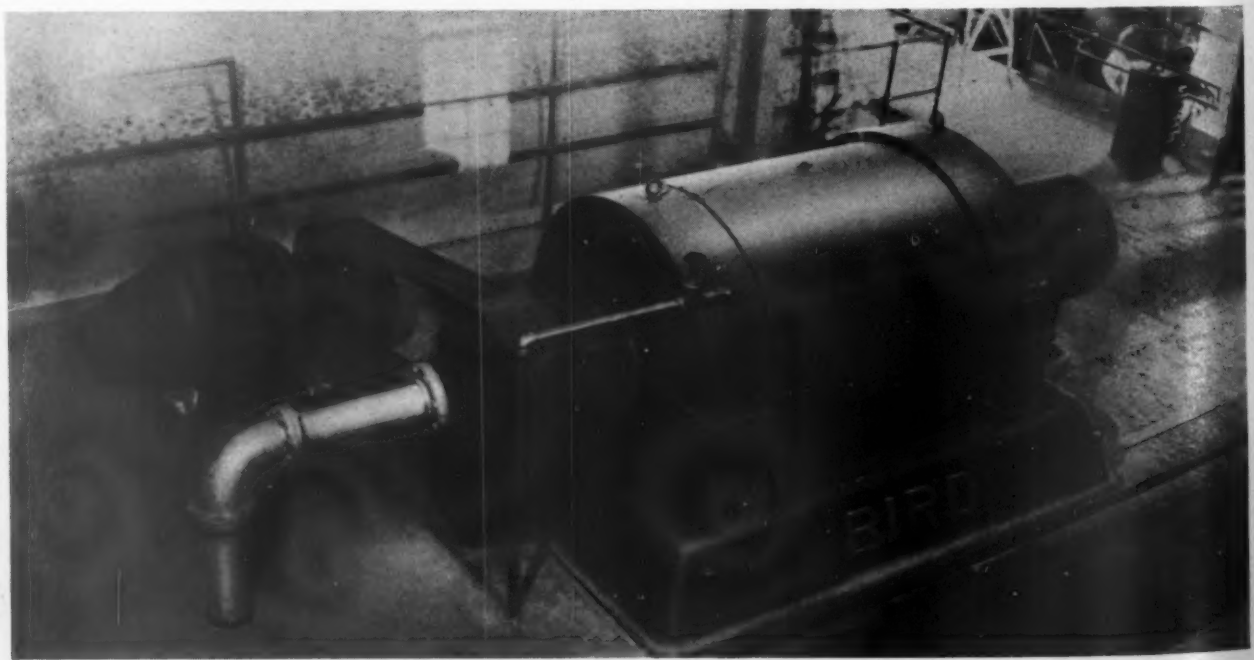
It delivers the fines already for burning. No thickening is necessary.

It returns the oversize so clean that tube mill efficiency and capacity reach a new high.

The BIRD does all this automatically, in small space, at low cost.

Let us tell you more about it.

BIRD MACHINE COMPANY
SOUTH WALPOLE MASSACHUSETTS



A development of
B.F.Goodrich
FIRST IN RUBBER



River of iron flows uphill on a rolling bed of rubber

A typical example of B. F. Goodrich improvement in rubber

POURING up that steep grade is a never-ending stream of iron ore—a thousand tons an hour.

Ore used to be shoveled into cars that inched their way out of deep mines; too expensive. Next they tried conveyor belts, but no belt could be made strong enough for long quarter-mile hauls like this one, and a series of belts was expensive, always causing breakdowns and delays.

Then B. F. Goodrich developed a new kind of belt made of individual cords surrounded by rubber. Because it is lighter, it can be made in almost any thickness and strength without getting stiff and unwieldy. One B. F. Goodrich belt of this new type was made, long enough to replace three belts formerly used. Because its design makes it light and flexible, this B. F. Goodrich belt takes exactly the right shape for carrying maximum load—and has been pouring 1100 tons of iron ore up and out of the mine every hour ever since.

Owners say this B. F. Goodrich belt is saving them $30,000 a year by elimination of transfer points, plus all the time and cost formerly wasted in shutdowns and repairs, and is increasing the output of the mine. Rubber products like this, *better suited to the job,* are resulting constantly from B. F. Goodrich research. As you get ready for greater peacetime business ahead, it will pay you to find out what BFG has developed that can help you increase production and reduce costs. *The B. F. Goodrich Company, Industrial Products Division, Akron, Ohio.*

B.F. Goodrich

RUBBER *and* SYNTHETIC *products*

VOLUME 49 ROCK PRODUCTS NUMBER 6

JUNE, 1946

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Nathan C. Rockwood, *Editorial Consultant*

This Month

Generally Speaking 54

Industry Problems at a Glance 67

Rocky's Notes—Tidbits of Progress 69

Washington News 71

The Personal Side of the News 73

News of the Industry 77

Hints and Helps 80

New Machinery 82

Distribution Plants Cut Handling Costs
Metropolitan Sand and Gravel Corporation constructs three distributioin plants to serve dealers with dry-batched aggregates and ready mixed concrete
Bror Nordberg 84

Fifty Years of Progress
Reviews interesting developments over 50-year period and points to trends of the future
Nathan C. Rockwood 86

ROCK PRODUCTS Makes Its Debut 88

Advances Made in Processing and Machinery 90

Engineering Talent in the Cement Industry 95

John Prince Recalls a Waste-Heat Power Plant of the 1900's 99

Quarrying Conditioned by Size of Crusher 100

Early Experiences in Crushed Stone and Cement
Ray C. Newhouse 102

How the Kominuter Got Its Name 103

How Big Crushers Were Developed *Richard Bernhard* 104

Blasting Developments 105

Sand and Gravel Industry Grows Rapidly with Concrete Construction *Nathan C. Rockwood* 106

Hydrated Lime—An Important Development 108

From Hand Labor to Machine Age
ROCK PRODUCTS' readers extend congratulations on Fiftieth Anniversary and reminisce on developments in the industry
109

Dust Control Important N.I.S.A. Topic 124

Fifty Years of Concrete Products
Unusual developments in the evolution of concrete traced through 50 years in ROCK PRODUCTS
Bror Nordberg 163

Vacuum Concrete and Vacuum Liifts
Employed in manufacture of reinforced concrete pipe, bridge slabs and other structural units
M. W. Loving 168

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★ in Ideas
★ in Design
★ in Features
★ in Performance

AND WE DO MEAN NEW!

The TL-20 is the first really new "postwar" shovel and crane—not a delayed prewar unit, not a war-built unit—but new and up-to-the-minute from mounting to boom head.

True, all basic functions are the same. It hoists, swings, travels and crowds. But the *way* it does these jobs is entirely new—in engineering design, in power, speed and output.

A COMPLETE PACKAGE—NO EXTRAS!

Each TL-20 is a complete package. All essential accessories—such as starter, generator, lights—are built into the standard unit. It's not a stripped-down unit; no "extras" to buy. It has the largest number of interchangeable parts ever built into a machine.

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5 Interchangeable Boom Assemblies for shovel, crane, clamshell, dragline or hoe operation.

Here's a real "Contractors' Machine"—a machine easy to understand, easy to service and maintain. See your nearest Thew-Lorain distributor now about the *postwar* TL-20—the newest thing in the ½ yd. class.



FREE... and full of facts



The complete, illustrated story on the TL-20 is contained in this bulletin. Ask your Thew-Lorain distributor for a copy or write Thew Shovel Co. direct.

Thew TL 20 Lorain

THE THEW SHOVEL CO.
LORAIN, OHIO

Available with 5 Interchangeable Booms and Choice of 10 Mountings

THERE'S A *Timken Rock Bit*

FOR PRACTICALLY EVERY KIND OF ROCK



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THE TIMKEN ROLLER BEARING COMPANY, CANTON 6, OHIO

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

ROCK BITS

SPODUMENE



for LITHIUM!

INDEPENDENT CROWD *plus* AUTOMATIC CROWD
FOR GREATER DIGGING POWER
The DUAL CROWD

But no matter what you call it, it means hard digging, and it takes a hard rock machine—a real Rock Shovel to handle.

This Northwest is taking out spodumene from which lithium and its salts are secured for alloys and aluminum welding.

The Northwest Shovel is a real Rock Shovel — a miners' and quarrymen's shovel. Built for the toughest job a shovel has to do, the handling of ore and rock, it brings you advantages that mean higher output and easier, low cost maintenance in mine operation.

The Dual Independent Crowd utilizes force that other shovels waste. The Cushion Clutch increases cable life, reduces the overload on drum shaft and associated parts and eliminates much clutch adjustment. The "Feather-Touch" Clutch Control makes operation easy and helps keep the output curve up to the end of the day, and many other Northwest advantages combine to speed operation. Ask about these advantages. There is a capacity and type for every job.

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If it's a real Rock Shovel you won't have to worry about output in dirt

NORTHWEST

Convertible for any Mining, Material Handling or Excavation Problem



Meet the Man Who Makes a Virtue of a

ONE-TRACK MIND

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If you want the man whose "one-track mind" can help you achieve utmost material handling efficiency, talk to an S-A engineer.



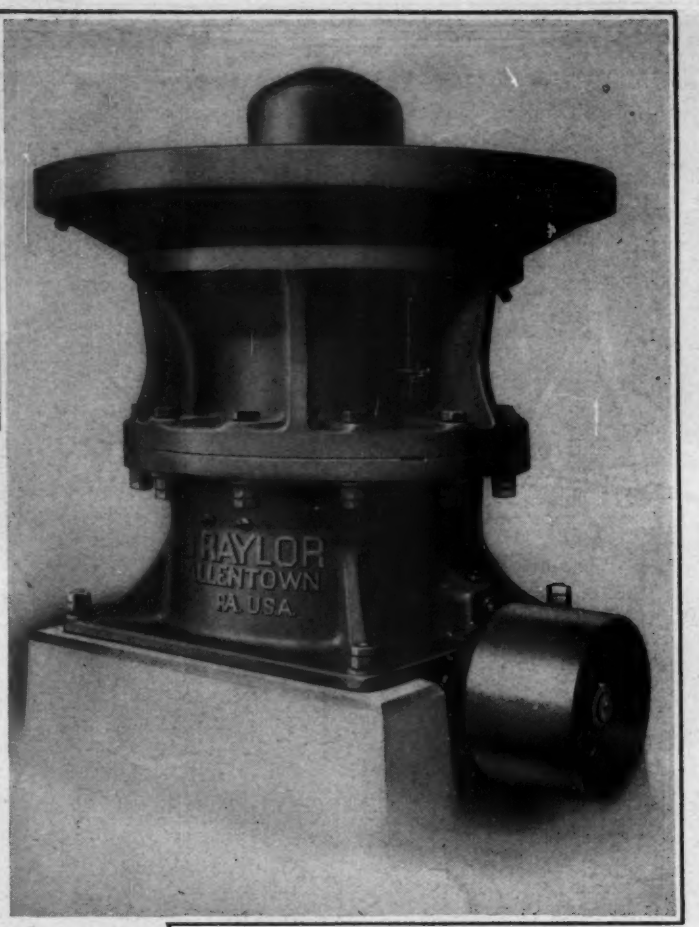
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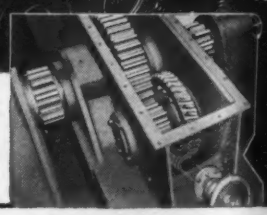
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Crowding action on electric shovels needn't be slow — merely because the machine is big.

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Shafts are shorter, therefore much stronger. Overhung gearing is entirely eliminated, resulting in better alignment and longer life . . . quieter and smoother operation.

And because of the worm drive, inertia is cut to the minimum. Its faster response and greater mechanical efficiency are the result of a special cone-type worm, running in oil.

Furthermore, the entire gear case and shipper shaft journals are welded integral with the boom, providing permanent alignment and adding greatly to boom strength and rigidity.

Easier, faster crowding with longer life is another way that P&H's progressive design is helping to increase production and cut tonnage costs on all kinds of large scale digging. The facts are yours for the asking.

P&H HARNISCHFEGER CORPORATION

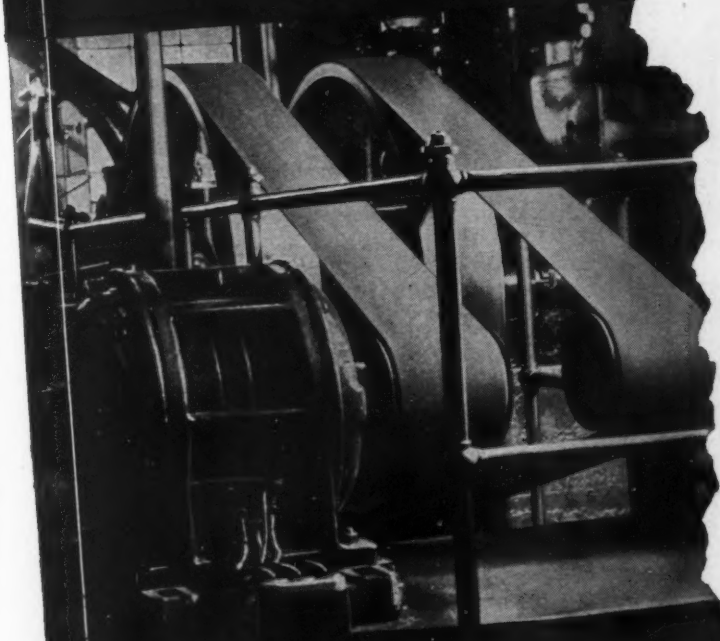
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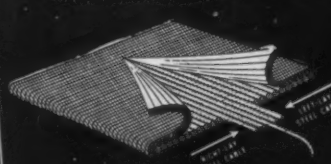
Tames "KILLER" DRIVES

—because it's sinewed with steel



GOODYEAR INDUSTRIAL RUBBER PRODUCTS

GTM-Specified COMPASS 250 STEEL CABLE TRANSMISSION BELT for Heavy-Duty Drives



The Goodyear COMPASS 250 Steel Cable Transmission Belt is bodied with multi-strand airplane-type cable, spiraled continuously without a splice. Cable on opposing sides of belt axis is twisted in opposite directions to insure true running.

IF you've got a drive that's a killer—a drive that quickly wears out even extra-tough belts—you can tame it with Goodyear's COMPASS 250 Steel Cable Belts. They have power-load capacity up to 37 horsepower *per inch of width!* TWICE the horsepower rating, width for width, of the best belts heretofore available!

That's because they're sinewed with endless, multiple-strand steel cables, embedded in the very highest quality rubber. As a result, COMPASS 250 belts can handle far heavier loads, withstand much higher tensions—thus making possible more compact drives with smaller belts and pulleys. COMPASS 250 is truly *stretchless.* Once fitted to a drive it seldom if ever requires take-up, and creep is negligible. It is far more flexible than any plied-up fabric-bonded belt and has far longer life expectancy.

You'll want all of the details on COMPASS 250 belts—facts and figures on the way they can increase operating efficiency while they lower maintenance costs. To get them, phone the G.T.M.—Goodyear Technical Man—or your nearest distributor of Goodyear Industrial Rubber Products.

• • •

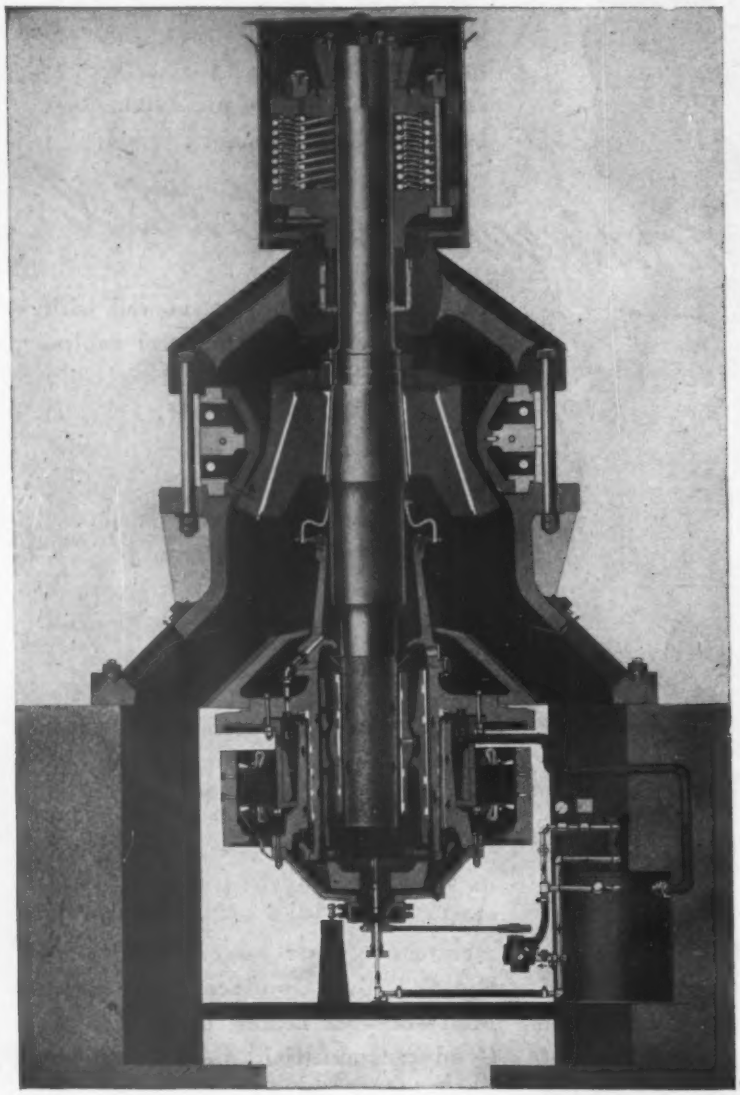
FOR HOSE, BELTING, PACKING, MOLDED RUBBER GOODS built to the world's highest quality standard, phone your nearest Goodyear Industrial Rubber Products Distributor.

Compass—T.M. The Goodyear Tire & Rubber Company

GOODYEAR

THE GREATEST NAME IN RUBBER

YESTERDAY TODAY and



KVS means

Kennedy Ball Bearing Gearless Crusher

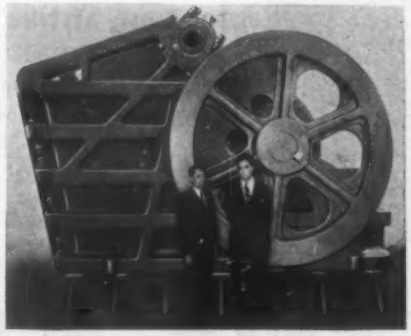
saves 80% on maintenance and 50% in power over geared crushers. No power is wasted on gears since the motor is built directly into the pulley assembly.

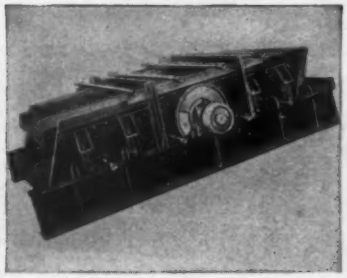
Reversible grinding ring gives double wear to wearing surfaces. Forced feed lubrication means long life for working parts. Easy accessibility, quick adjustment of crusher opening cut down standby time.

KVS

JAW CRUSHERS

are the extra heavy duty type for handling large tonnages of toughest rocks. Available in sizes to meet all output and feed requirements.





KVS VIBRATING SCREENS give 95% sizing efficiency. Low installation and maintenance costs. Available in three types and many sizes.

KENNEDY-VAN SAUN MFG. & ENG. CORPORATION

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leadership in Machinery Design—

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Together, we have progressed from pioneering beginnings of 40 and 50 years ago, through today's high production standards, and forward toward even better things of the future.

Kennedy-Van Saun congratulates ROCK PRODUCTS on its 50 years of outstanding service to the industry and sees in this milestone only the beginning of greater years of service ahead.

To the thousands of progressive producers who make up the KVS family of customers, we pledge that our present high standards of machinery building will be maintained and that KVS leadership is scientifically designed machinery for low cost production of high quality materials.

THE KVS LINE

KILNS	SCREENS	CLASSIFIERS
COOLERS	FEEDERS	WASHERS
DRYERS	CONVEYORS	DUST COLLECTORS
CRUSHERS	ELEVATORS	AIR SEPARATORS
HAMMERMILLS	GRINDING MILLS	

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Write Today— for our catalog and description on these and other types of KENNEDY machinery.

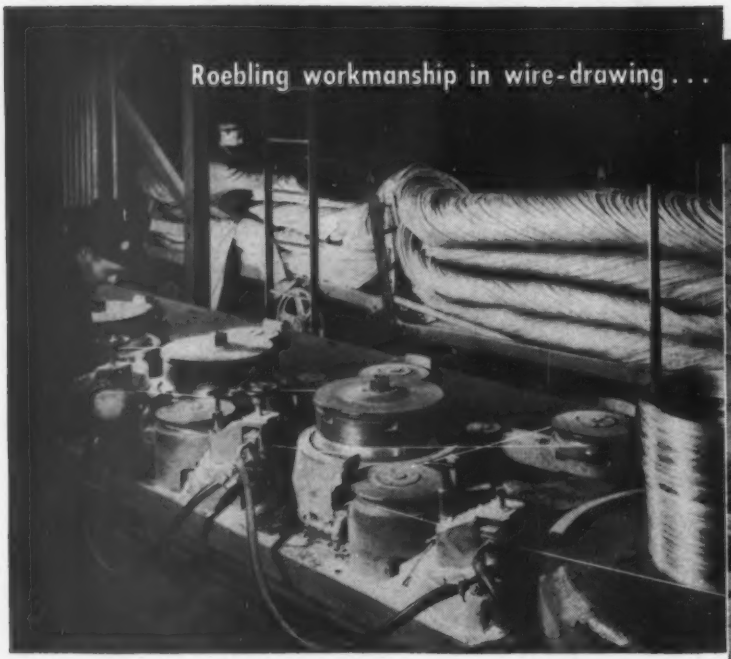
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CAN HELP CUT AGGREGATE COST



Old Man Competition Is Getting Ready . . .
Roebling wire rope can help keep your costs down





TODAY, your business is returning to "normal" peacetime conditions. But it's far from the pre-war normal. Equipment costs are up. Labor costs are higher. Operating costs *must be held down*. One way to hold them down is to specify Roebling "Blue Center" Steel Wire Rope.

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Whether your needs call for preformed or non-preformed wire rope, Roebling engineers can help you save . . . with sound advice on rope selection, installation and operation. Ask our nearest branch office about it.

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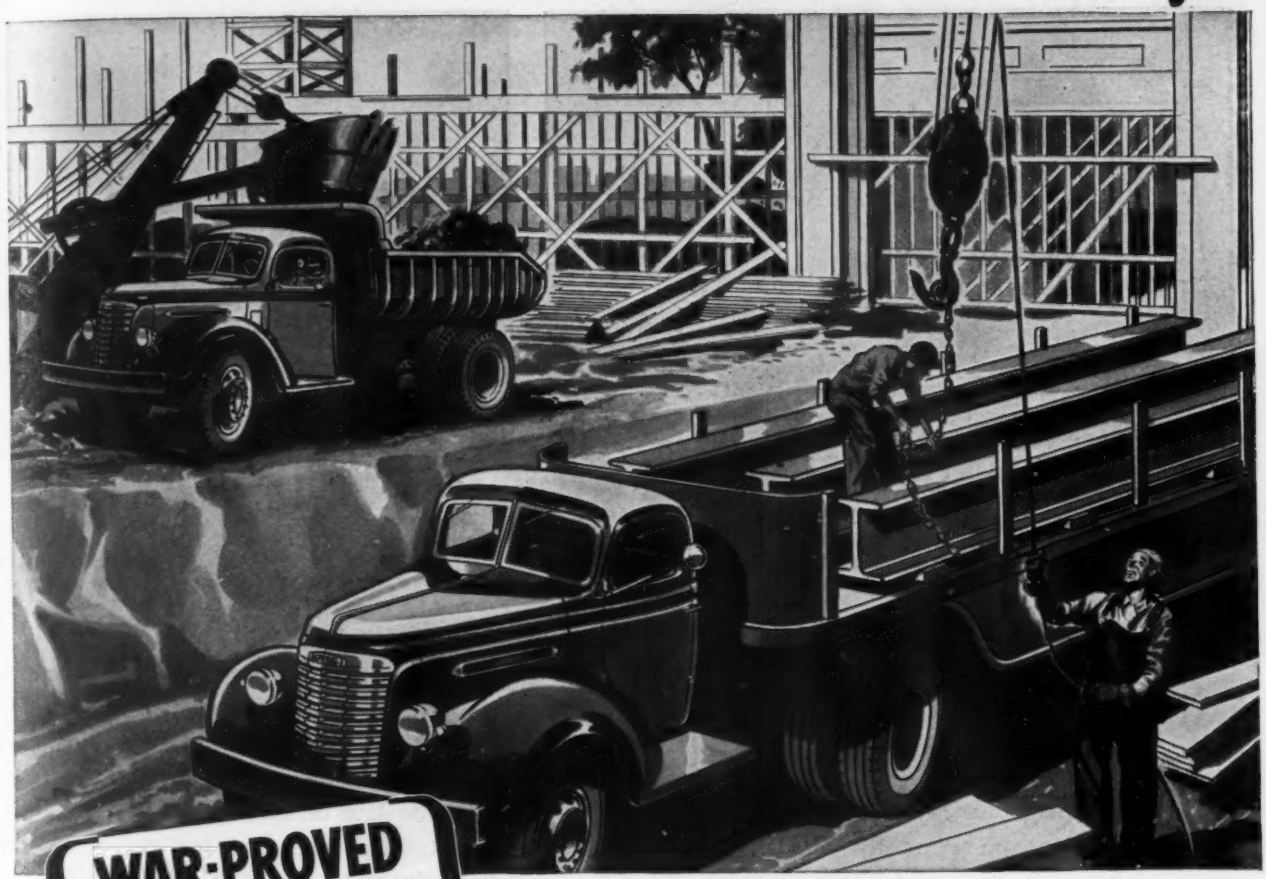


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WAR-PROVED and IMPROVED FOR 1946

- Powerful, economical "Army Workhorse" engines of Valve-in-Head design with Tocco-hardened Crankshafts, Airplane type "Durex" Main Bearings, Heat-resisting Exhaust Valves with Improved Valve Seat Inserts, Positive Crankcase Ventilation, Turbo-Top Pistons and Full Pressure Lubrication through Rifle Drilled Connecting Rods.
- Rugged, built-for-the-job chassis with extra strong Frames, Springs and Axles, heavy duty Transmissions and Clutches, Needle Bearing Universal Joints, Recirculating Ball-Bearing Steering and powerful, easy-action Brakes.
- Rider Ease Cabs with Cradle-Coil Cushions, Wide Visibility "V" Windshields, Quick-vision Instrument Panels, All-Weather Insulation and Controlled Ventilation.

New GMCs offer you the most in heavy duty truck value in a most complete selection of models. There are tractor units, dump models, four-wheelers and six-wheelers in tonnage ranges to fit every requirement . . . and with equipment options which include worm, double reduction and dual drive axles, 5-speed underdrive and overdrive transmissions, gasoline and diesel engines, heavy duty clutches and air brakes. It will pay you to investigate GMC. For, whatever you haul . . . sand and gravel, cement, ore, steelwork, heavy construction equipment and many more . . . you'll find a war-proved, improved GMC truck ideally suited to the job.

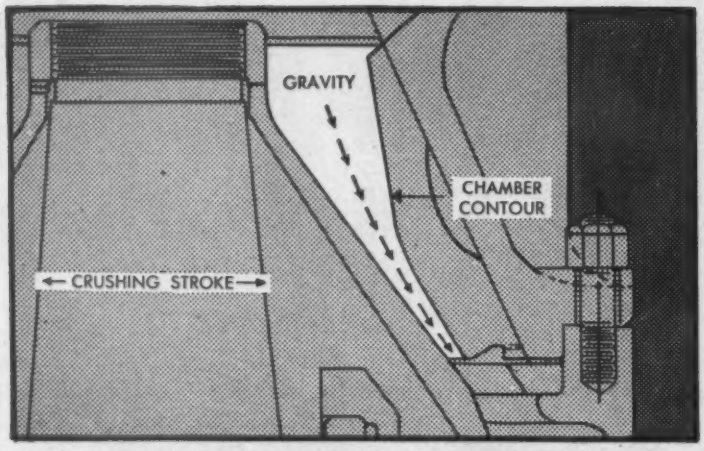
THE TRUCK OF VALUE

GMC TRUCKS

GASOLINE
DIESEL

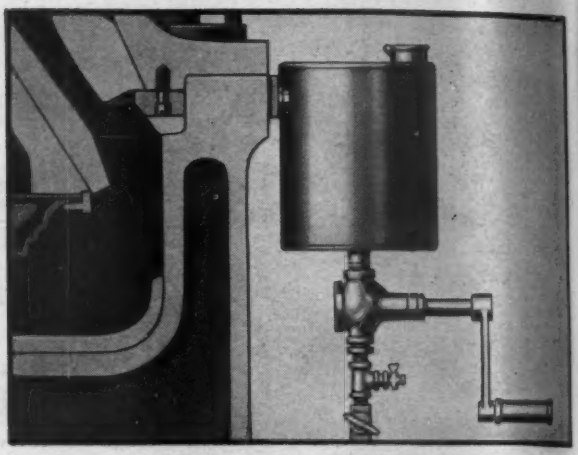
GMC TRUCK & COACH DIVISION • GENERAL MOTORS CORPORATION

You Get All 4



1. GREATER PRODUCT UNIFORMITY

More uniformity and more tonnage — get *both* with the Type "R" reduction crusher! Scientific, advanced A-C crushing chamber design... combining factors of chamber contour, gravity, and crushing stroke... result in maximum fragmentation uniformity—stepped-up capacity and lower crushing costs! You get a greatly improved product.



2. COMPLETE FLEXIBILITY

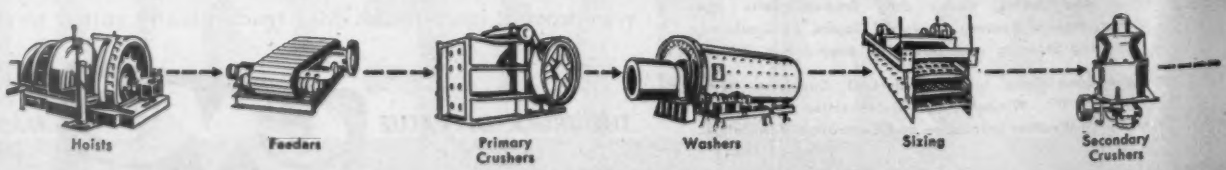
Change product size... instantly... with just the turn of a hand crank! Exclusive, A-C "Speed-Set" control on the Type "R" makes possible precision product control *without stopping crusher*... prevents costly outage time... provides continuous compensation for crusher chamber wear.

LOWER CRUSHING COSTS for you — that's what these *four great features* of the Allis-Chalmers Type "R" crusher add up to. Product Uniformity ... Machine Flexibility ... Less Maintenance ... Less Outage Time — solid reasons why the Type "R" brings you savings that widen profit margins!

You gain in durability, too! The Type "R" reduction crusher is built for long life. Wearing parts are made of heat-treated manganese steel. A recessed spider cap at top transfers much wear from crusher parts to feed material. Resilient mountings dampen down vibration, eliminate need for massive foundations.

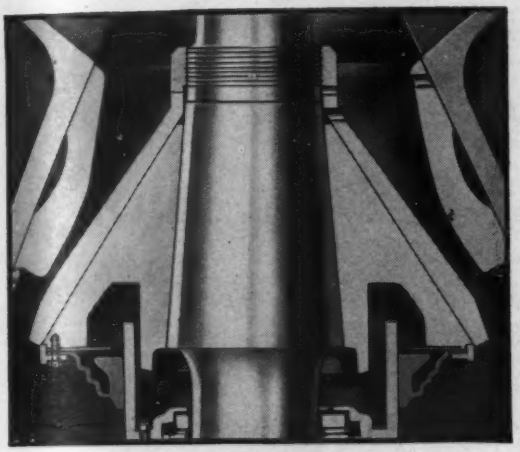
And—you save on initial cost! The Type "R", with all its advantages, costs less than comparable crushers! For complete details see your nearby A-C office, or write for Bulletin B6006C. ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN.

ALLIS AC CHALMERS



Benefits

WITH THE TYPE "R" REDUCTION CRUSHER!



3. LESS MAINTENANCE

Such features as flood lubrication of moving parts, dust sealed bearings, easily removed crushing ring that locks in place and doesn't budge, make maintenance on the Type "R" crusher *quick* and *easy* . . . cut down time . . . lower costs.



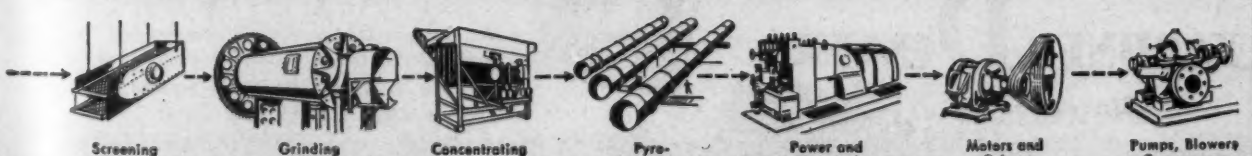
4. FAST, EASIER CLEARING

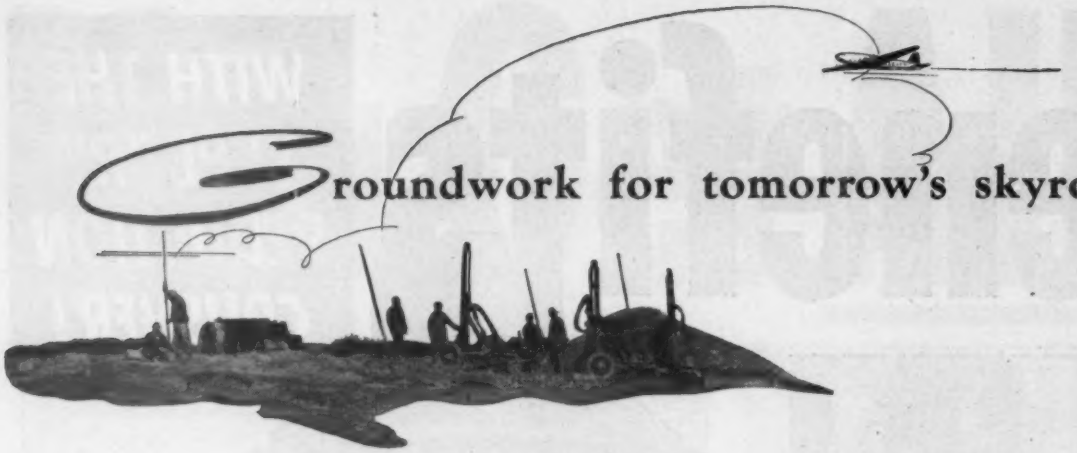
The same hand crank that controls product feed size can unload the Type "R" in a matter of minutes in the event of power failure. Also — a special relief valve frees crusher of foreign material, such as tramp iron, safely . . . without stopping crusher.

The Type "R" reduction crusher is one of four *basic types* of crushers built by Allis-Chalmers . . . world's largest manufacturer of rock and ore crushing machinery. You get equipment that's exactly *right* for *your* job — from Allis-Chalmers!

A 2050

One of the Big 3 in Electric Power Equipment
Biggest of All in Range of Industrial Products





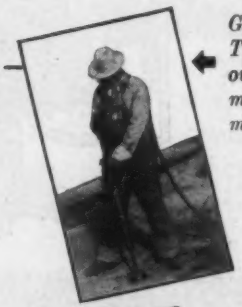
Groundwork for tomorrow's skyroads

Another huge job is just ahead for you who have built America's highways. For America is taking to the air—and that means a network of airports. You can speed up airport construction and cut cost, too—if you have Gardner-Denver construction equipment to back up your men.

Gardner-Denver equipment can help you step up the pace of construction, for it stays on the job. Endurance has been built into it to assure efficient service without frequent "time out" for maintenance. For complete information, write the Gardner-Denver Company, Quincy, Illinois.



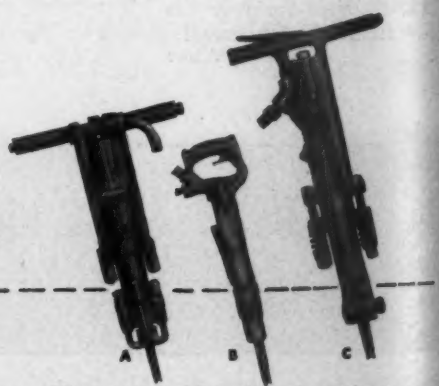
Gardner-Denver Gasoline or Diesel Water-cooled Compressors are completely water-jacketed for efficient, continuous operation in any climate or altitude.



Gardner-Denver Backfill Tamper is easy to walk over the fill—meets the most exacting requirements.

Gardner-Denver UM-99 Wagon Drill . . . fast, powerful and highly maneuverable.





A. *Gardner-Denver S-55 Sinker—a fast, easy riding drill with remarkable hole-cleaning ability.*

B. *Gardner-Denver 28 Spader reduces digging time. Available with a variety of tools.*

C. *Gardner-Denver B-72H Paving Breakers strike powerful blows for rapid, economical demolition.*

GARDNER-DENVER

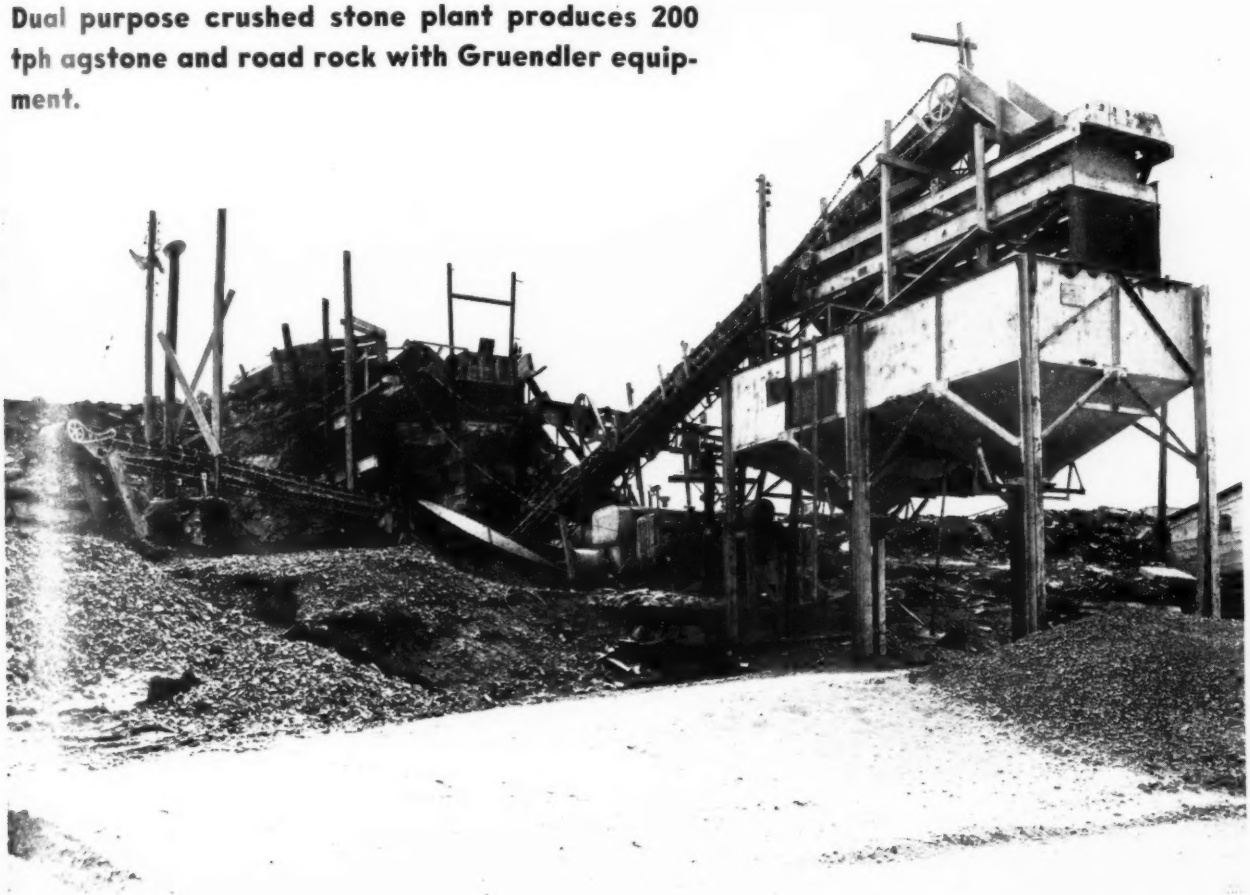
Since 1859



Gruendler

presents: Better Ways to Increase Plant Capacity

Dual purpose crushed stone plant produces 200 tph agstone and road rock with Gruendler equipment.



Bulletin BR-200

. . . Gruendler Crushers and Pulverizers since 1885 . . .

GRUENDLER CRUSHER & PULVERIZER CO.

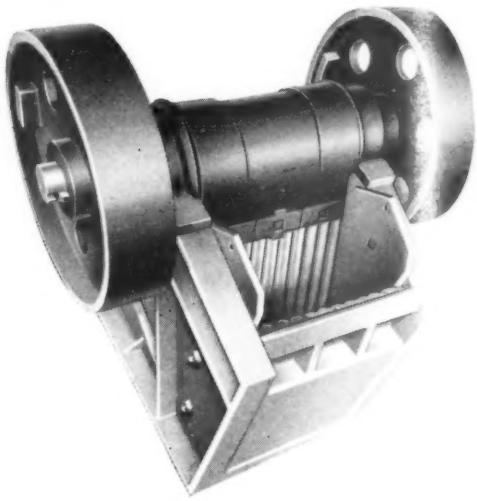
PLANT AND GENERAL OFFICES, 2915-19 NORTH MARKET STREETS • • SAINT LOUIS 6, MISSOURI

A Rock's Eye View

Jaw Crushers
by Gruendler

- for hardest rock
- long jaws
- self-aligning SKF roller bearings

10 sizes from 10"x16" to 30"x42"
Write for Bulletin BR5 No. 2

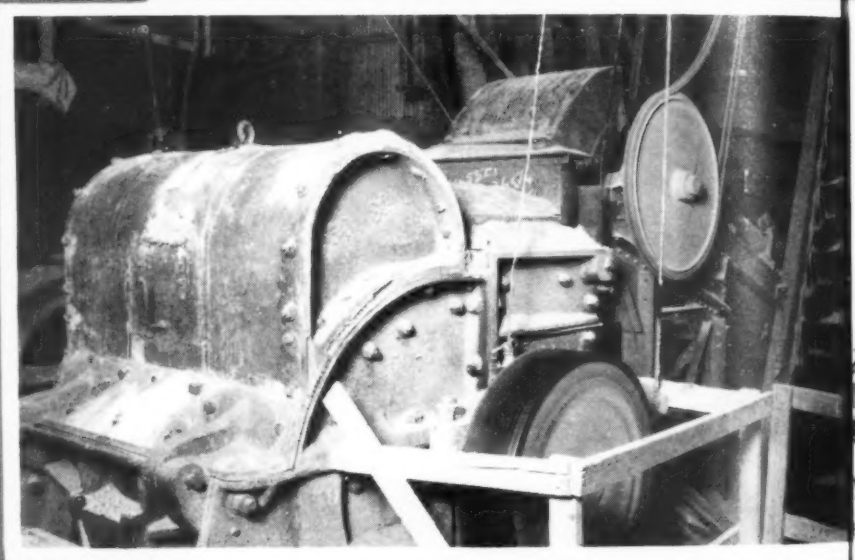


Hammermills
by Gruendler

- unequaled for ag-lime or limestone aggregate production
- reduces stone passing feed opening to agstone or road stone in one operation
- uniform cubical product

20 sizes with up to 36" feeder opening:
5 to 500 tph

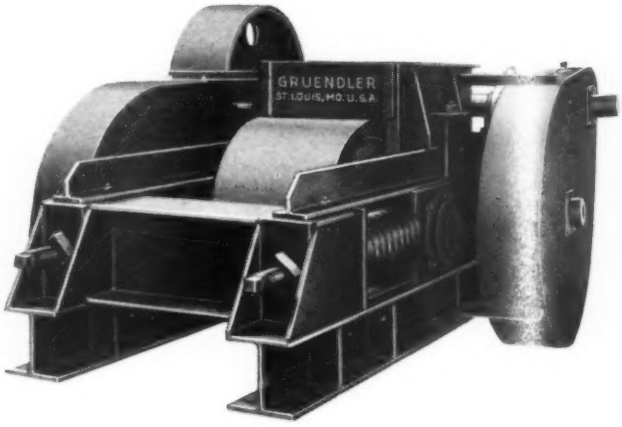
Write for Catalogue No. 800

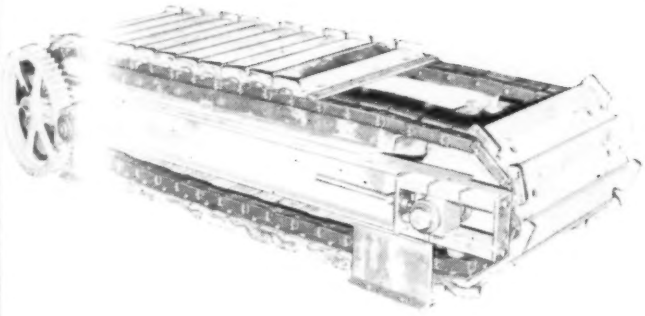


Roll Crushers
by Gruendler

- enclosed all-gear drive
- solid manganese shells
- X-braced frame
- roller bearings throughout

Sizes 18", 24", 30", 40", 56" dia.
Write for Catalogue No. 700





Feeders
by Gruendler

- for continuous high capacity operation
- overlapping manganese pans, no leakage
- enclosed gear drive

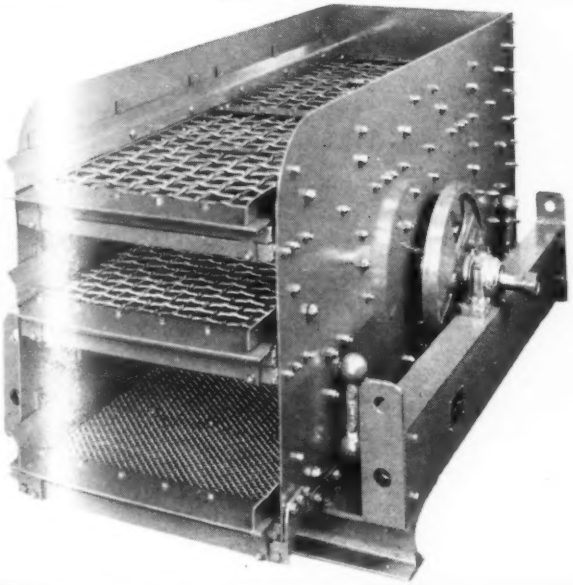
Sizes 24", 30", 36", 42", 48" widths; 6' to 16' lengths
Write for bulletin on feeders



Gruendler

- Bins . . . Bin Gates
- Conveyors (lattice and channel types)
- Portable trucks
- Complete plant layouts (portable and stationary)
- Engineering Service

Write for Catalogue 601



Screens
by Gruendler

- vibrating and revolving types
- clean separations, accurate sizing
- heavy side plates, sturdy construction
- low power costs, high production capacity

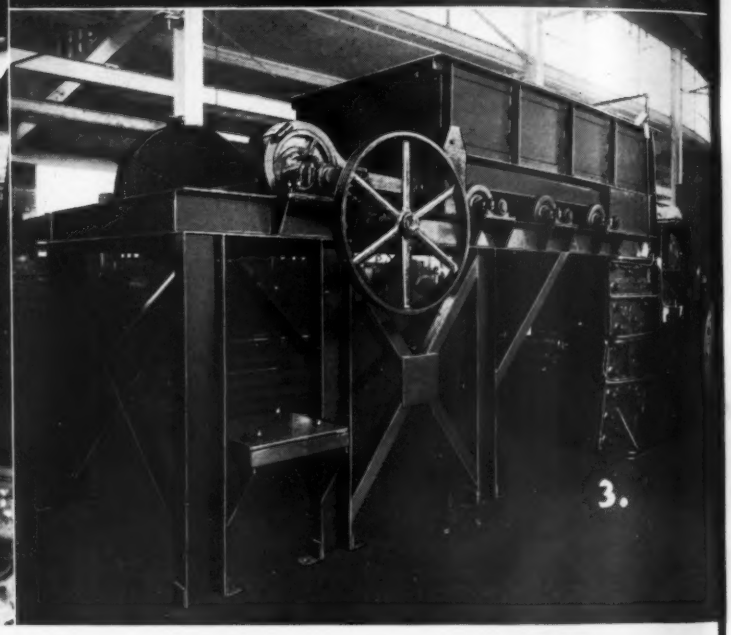
Vibrating screen sizes from 18"x36" to 5'x16'
Revolving screen sizes 24" to 60" dia.

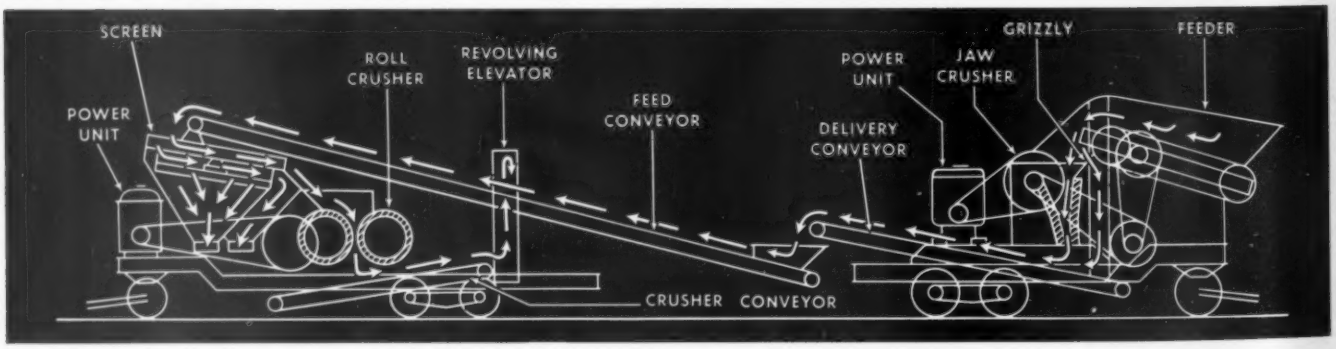
Write for Screen Bulletin

Gruendler *plants of all capacities . . .*









Typical Gruendler two-unit portable rock and gravel plant, used in all parts of the world.

1. **Gruendler center-feed hammermill for large volume pulverizing of agricultural limestone in Langford plant, Gallatin, Tenn.**

2. **Even the largest Gruendler Crushers available as portable primary units.**

3. **Gruendler hammermill for crushing nickel ore in Ural mountains, U.S.S.R.**

4. **Hammermill shipment to large eastern cement plant.**



GRUENDLER CRUSHER & PULVERIZER CO.

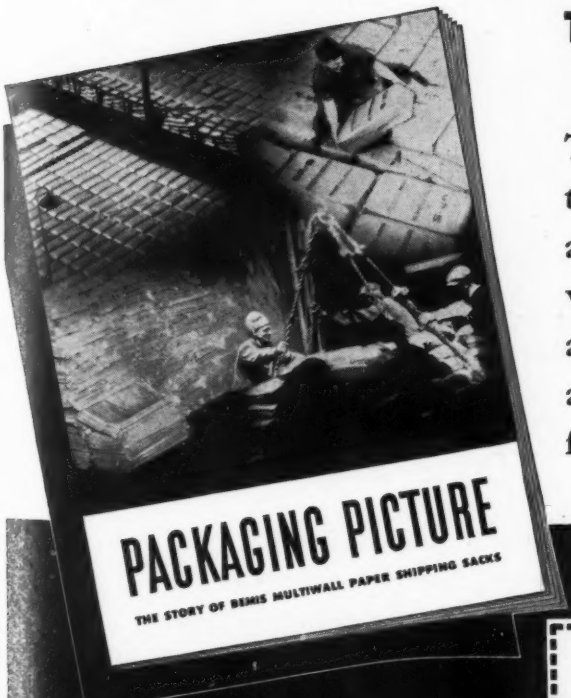
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New! Complete! Concise!

THE BEMIS BOOK ON MULTIWALL PAPER SHIPPING SACKS TELLS HOW YOU CAN GET...

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3. More efficient packing operations
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5. Finer, more legible brand printing

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The Story of BEMIS Multiwall Paper Shipping Sacks

This new 16-page book—largely pictorial—shows how Bemis Multiwalls are made . . . how you can use these versatile shipping containers most advantageously . . . how Bemis Packaging specialists can help you. You'll find it interesting as well as beneficial.

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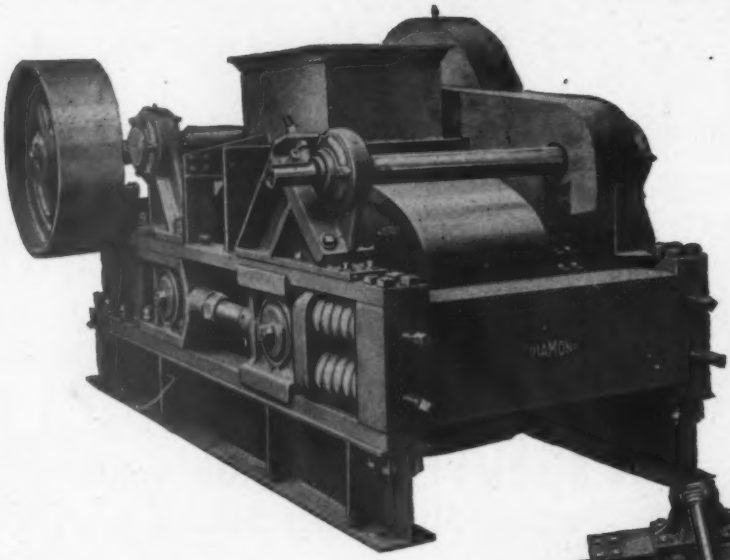
*Firm*_____

*Product*_____

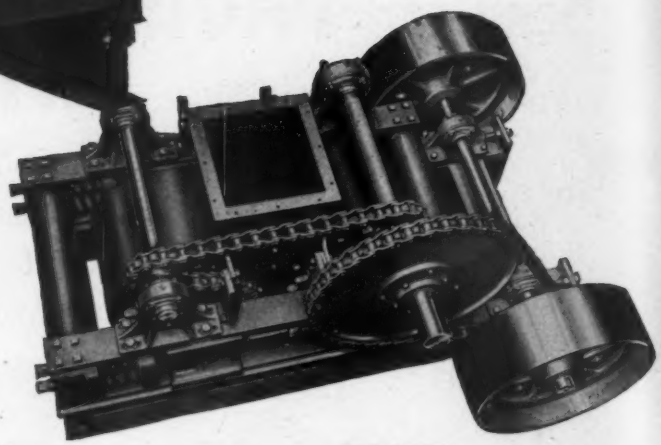
*Street*_____

*City*_____ *State*_____

For Profitable Secondary Crushing
SELECT THE RUGGED
DIAMOND ROLL CRUSHER



THERE'S NOTHING TOUGHER THAN A DIAMOND



TOP VIEW

Here's the "NO SHUT-DOWN" Staying Power You Want — Ask Any DIAMOND OWNER

With a DIAMOND Roll Crusher you can often double or triple your net profits on finely crushed aggregate. DIAMOND Roll Crushers are brutes for punishment—they stay on the job and roll out high tonnage month after month, year after year. There isn't a weak spot in the whole crusher—every part is extra strong. Each size has ample margin over its rated capacity. We repeat—ask any DIAMOND Owner! Six sizes roller bearing —four sizes plain bearing. Ask your DIAMOND Dealer, or write us for Bulletin D-45C.

Other DIAMOND Products

Portable Crushing & Screening Plants		Grizzlies
Portable Primary Crushing Plants		Conveyors
Portable Screening & Washing Plants		Feeders
"DUAL-ACTION" Crushers		Hammermills
Jaw Crushers	Drag Washers	Bins—Hoppers
Vibrating Screens		Scalping Screens

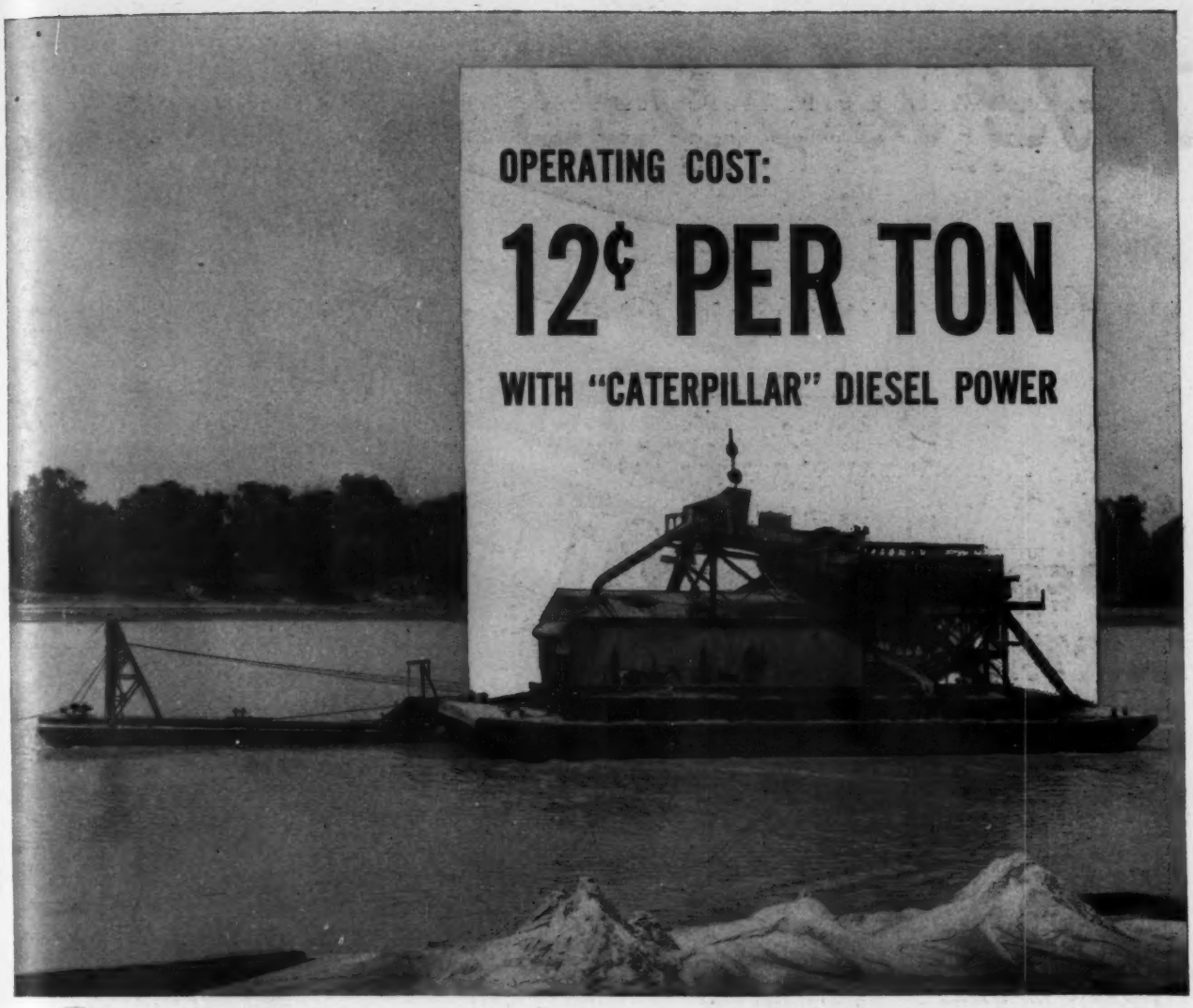
"THERE'S NOTHING TOUGHER THAN A DIAMOND"

DIAMOND

DIAMOND IRON WORKS, INC.

AND THE MAHR MANUFACTURING CO. DIVISION

1800 SECOND STREET NORTH MINNEAPOLIS 11, MINNESOTA



Three "Caterpillar" Diesel Engines—two D13000s driving a 12" pump and a D17000 operating a generator to supply electricity for all the auxiliary equipment—power this sand dredge owned by the Stewart Sand & Material Co. of Kansas City, Missouri.

The machinery aboard the dredge pumps 2000 tons of sand per 8-hour day, classifies it, and delivers it to the barges at a total power cost of 12 cents per ton.

Responsive "Caterpillar" Diesels make it possible to vary the speed of the pumps and the output of the generator to meet different dredging conditions. And, when it becomes necessary to operate at peak capacity hour after hour, these engines deliver without faltering or failing.*

They are also economical to operate. The cost of fuel and lubricating oil for all three power-plants is less than $10 per day.

Repair and maintenance costs have been low and when service is needed it is obtained promptly and efficiently from a nearby "Caterpillar" dealer.

See your "Caterpillar" dealer about the advantages of this economical, dependable power for your job.

*The horsepower of "Caterpillar" Diesel Engines is ALL WORKPOWER. Ratings show output of a fully equipped engine — not the momentary peak performance of a power-plant stripped of fan, pumps or other necessary accessories.

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

CATERPILLAR DIESEL

REG. U.S. PAT. OFF.

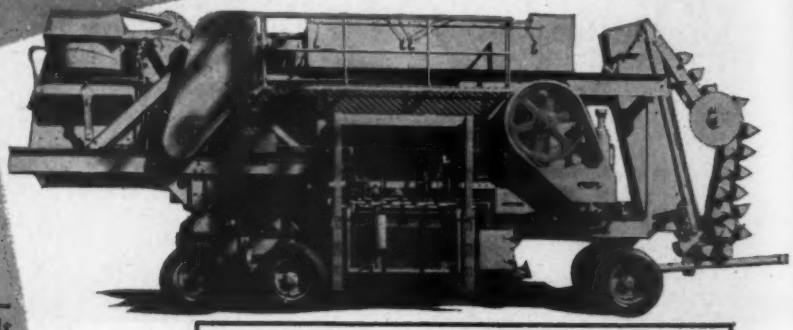
ENGINES • TRACTORS • MOTOR GRADERS • EARTHMOVING EQUIPMENT

THE MODEL

FIRST in Portability
FASTEST Set-up
FINEST Mixes

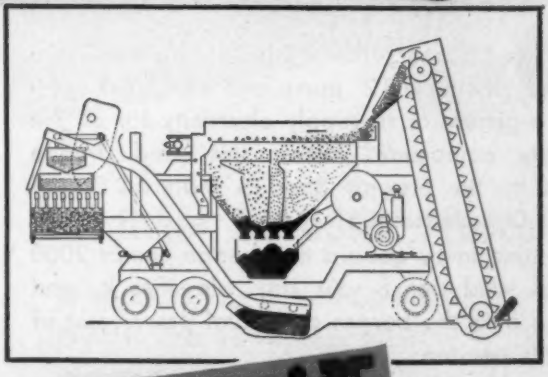
A SUPER-PORTABLE BATCH TYPE ASPHALT PLANT

—THE MODEL F



● Yes, sir—here it is—the Model F—a 2500-lb. batch type portable asphalt plant that you can set up and get into operation in a matter of minutes. The only part that has to be raised is the folding elevator. Twin-shaft, 2500-lb. capacity pug mill, 36"x10' triple-deck horizontal Cedarapids Symons screen, 4-compartment (6 batch) hopper, 25 cu. ft. batcher, 2500-lb. springless dial scale, 25 cu. ft. skip hopper, and steam-jacketed pump are in place at all times. Ground level charging hopper assures quick, easy loading. Pug mill discharges directly into trucks thereby eliminating troublesome delivery conveyor belts. Operator's platform on the ground level makes possible one-man control of all operations. Offered with a choice of gas, diesel or electric power, with or without a drier for hot or cold mixes.

The Model F is the ideal plant for paving contractors, counties, and state highway departments. It grades the aggregate, weighs the material, mixes it to suit specifications, does it better and satisfies the most rigid inspection. Get the details today.



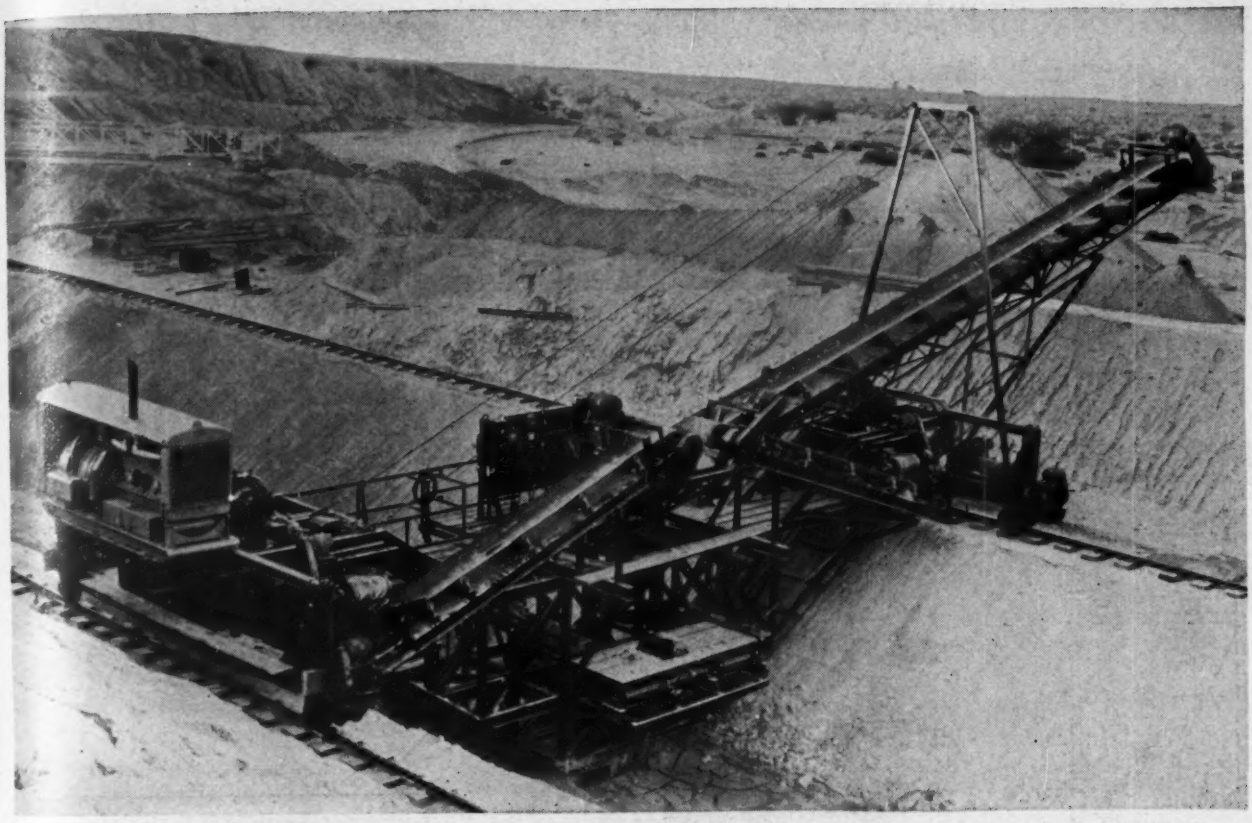
Cedarapids

Built by IOWA

IOWA MANUFACTURING COMPANY
Cedar Rapids, Iowa, U. S. A.

THE IOWA LINE
of Material Handling Equipment Includes

ROCK AND GRAVEL CRUSHERS
BELT CONVEYORS—STEEL BINS
BUCKET ELEVATORS
VIBRATOR AND REVOLVING SCREENS
STRAIGHT LINE ROCK AND GRAVEL PLANTS
FEEDERS—TRAPS
PORTABLE POWER CONVEYORS
PORTABLE STONE PLANTS
PORTABLE GRAVEL PLANTS
REDUCTION CRUSHERS
BATCH TYPE ASPHALT PLANTS
TRAVELING (ROAD MIX) PLANTS
DRAG SCRAPER TANKS
WASHING PLANTS
TRACTOR-CRUSHER PLANTS
STEEL TRUCKS AND TRAILERS
KUBIT IMPACT BREAKERS



Power from a MURPHY DIESEL ME-6, 100 KW Generator Set, generates current for all the electric motors that operate the big canal sub-grader shown here, while also powering a 5 KW Transformer to provide lights for night work on the project. This unique machine is turning the last 8 to 10 inches of material from a canal in Southern California, bringing it to grade for concrete lining . . . another example of MURPHY DIESEL versatility.

Low Cost Dependable Murphy Diesel Power

THE fine records MURPHY DIESELS have made as power units on many types of construction machinery have convinced manufacturers and owners of such equipment that MURPHY DIESEL power means DEPENDABILITY.

Murphy Diesel powered rock crushers, for instance . . . and gravel plants, excavators, hoists, pumps, locomotives, lumber and logging plants, mining equipment, oil drilling rigs, work boats, and other standard heavy-duty equipment . . . have won wide acceptance among users who value dependability above all else in power units.

On many specially designed machines, too, like the big canal sub-grader shown above, MURPHY DIESELS contribute much to successful performance. Rugged; compact; easy to start in any weather; reliable performance; and economy in operation and maintenance, are reasons why heavy duty equipment new or old, powered by MURPHY DIESEL, can be depended upon for more power, more profit!

See the nearest MURPHY DIESEL dealer, or write for bulletin.

FIELD-PROVEN *Power*..

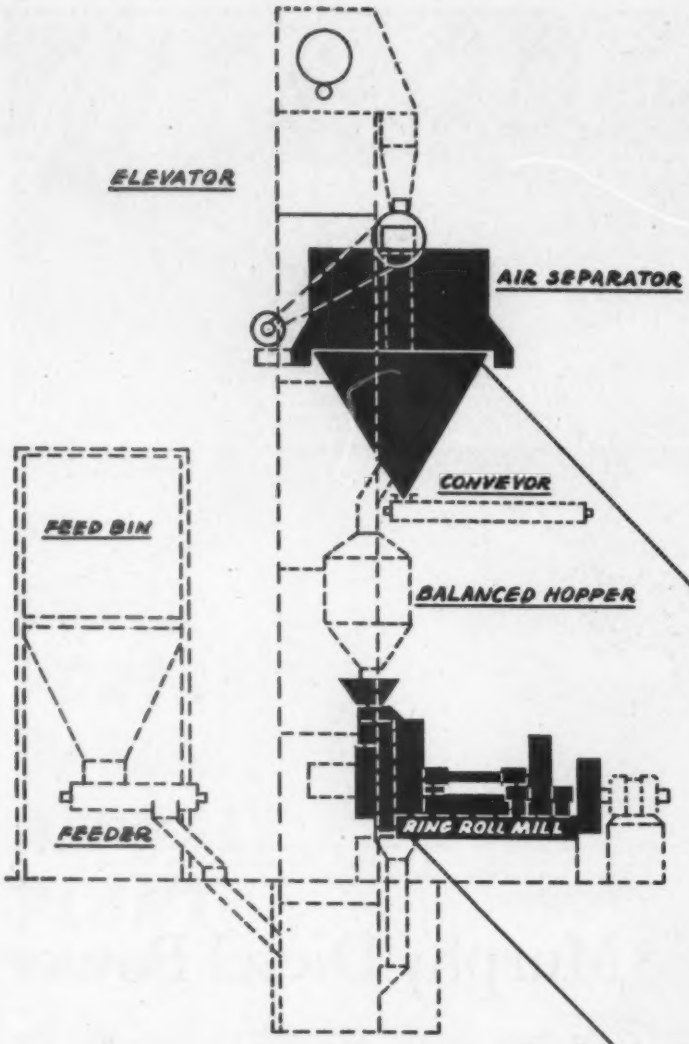


118

MURPHY DIESEL COMPANY

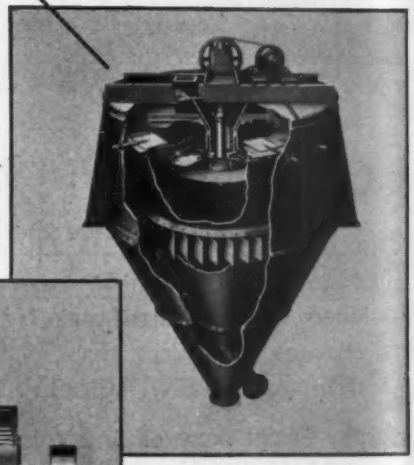
Engines from 90 to 215 H.P. Generator Sets from 60 to 115 K.W.

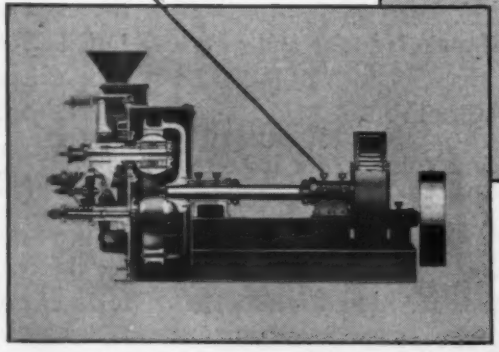
5315 W. BURNHAM STREET • • • • • MILWAUKEE 14, WISCONSIN



The RIGHT Combination

For Top Tonnage at Reduced Costs





WHIRLWIND AIR SEPARATOR
Capacities ¼ to 50 tons per hour.
Range 40 to 325 mesh or finer.

RING ROLL MILL
Capacities 12 to 18 tons per hour.
Range 10 to 200 mesh.

STURTEVANT

Air Separators and Ring Roll Mills

Here's a combination for finer ground limestone, lime and hydrate with maximum efficiency . . . Sturtevant air separators and Ring Roll Mills in closed circuit.

The ring roll mill crushes either hard or soft materials for medium or fine reductions (10 to 200 mesh). The air separator efficiently carries off all classified material in any desired range from 40 to 325 mesh or finer. The combination increases output up to 300% . . . saves in power cost up to 50%.

You should consider the tonnage and controlled product benefits of Sturtevant Equipment. Write for full information and catalogs. Sturtevant Engineers are available for consultation on your grinding and separating problems. Their services are obtainable without obligation.

STURTEVANT
MILL COMPANY
41 Harrison Square, Boston 22, Mass.

Designers and Manufacturers of
CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS
MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS

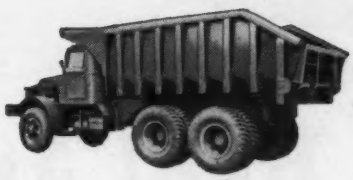
THE BEST COSTS LESS

TRADE MARK

For years Gar Wood has consistently offered truck and trailer equipment of utmost utility and outstanding value. Leadership in this field resulted from this policy. Gar Wood equipment costs less in the long run because it is better built to give peak performance and lasting satisfaction.



Type C12 Body and Model D6 or D7 Hoist. Dumping angle 55°.



Type X-112 Extra heavy duty Body with automatic downfolding tailgate.



Special rock Body, scoop type rear end. Model F4CA cam and roller Hoist.



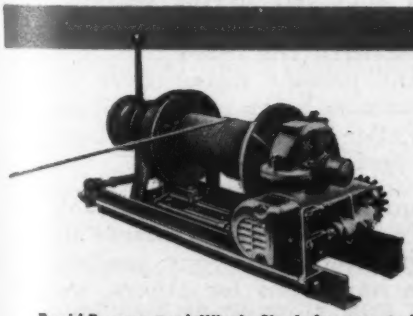
Type W12 Body. Model F4C cam and roller Hoist. Capacity 6 cu. yds.



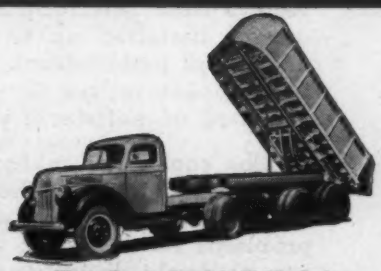
Type X-112 Extra heavy duty Body, scoop end, with Model T-4440 Hoist. Capacity 19 cu. yds.



Type W12 Body, front recessed for Model TV83 Hoist. Capacity 15 cu. yds.



Rapid Reverse truck Winch. Single lever control. Capacities 15,000 to 60,000 pounds line pull.



West Coast Special W-12 Body, Model F8C cam and roller Hoist. Capacity 10 cu. yds.



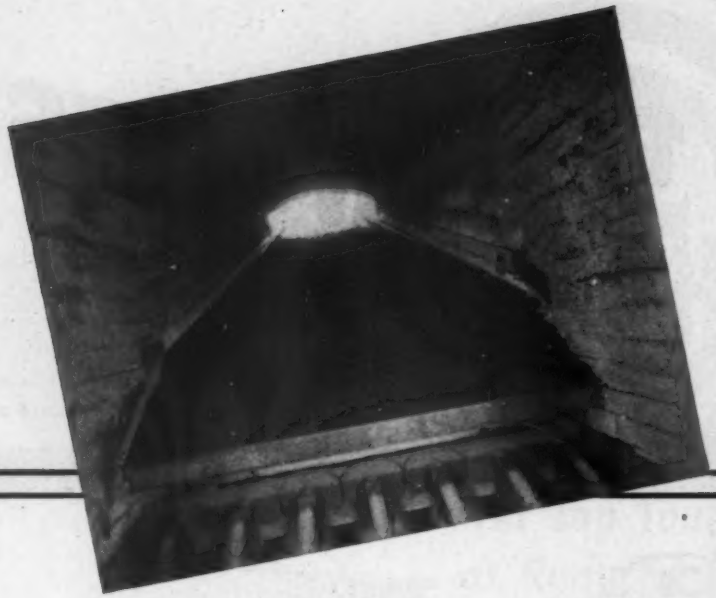
Telescopic boom Crane. Radius 8 to 20 feet.

GAR WOOD INDUSTRIES, INC.

7924 RIOPELLE ST. DETROIT 11, MICH.

WORLD'S LARGEST MANUFACTURERS OF TRUCK AND TRAILER EQUIPMENT

OTHER PRODUCTS: TRUCK TANKS ROAD MACHINERY HEATING EQUIPMENT MOTOR BOATS



FULLER
AIR-QUENCHING
INCLINED-GRATE
COOLER

Doing a Real Job for the Industry

Not just another cooler, but one that meets the exacting requirements of the cement industry:

Maximum efficiency in air-quenching to produce clinker of high glass content

Efficient heat recuperation

Discharge of clinker at final temperatures desired for efficient grinding.

Designed and built by engineers having years of experience in cement-mill practice, most satisfactory results have been obtained with the more than 100 coolers installed up to the present time. Over 50 additional installations are now being made. Fifty-four repeat orders for Fuller coolers are the best evidence of satisfactory performance.

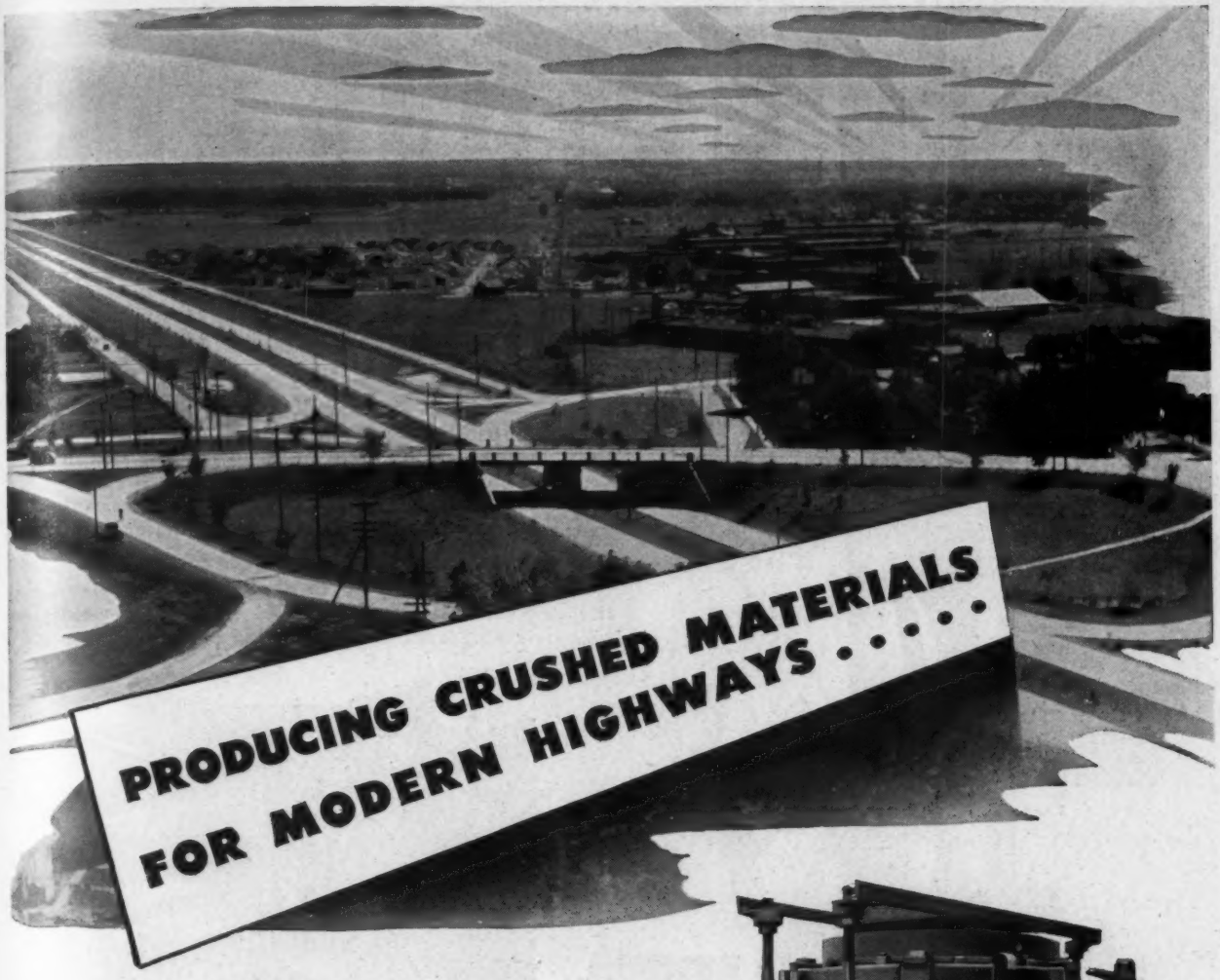
The cooler has many outstanding advantages not to be found in any other cooler now being offered to the industry. Why not look into your cooling problems now? What we have done for others, we can no doubt do for you.

WE BUILD

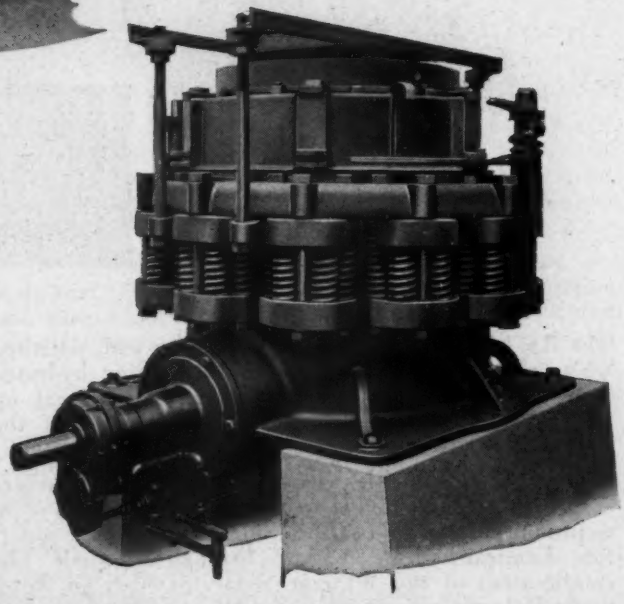
Fuller-Kinyon Conveying Systems
Fuller-Fluxo Conveying System
The Airveyor Conveying System
Rotary Compressors and Vacuum Pumps
Air-Quenching Inclined-Grate Coolers
Dry Pulverized-Material Coolers
Rotary Feeders and Gate Valves
Material-Level Indicators
Motion Safety Switch
Aeration Units
Slurry Valves
Samplers

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Washington 5, D. C. · 618 Colorado Bldg.

CO-18

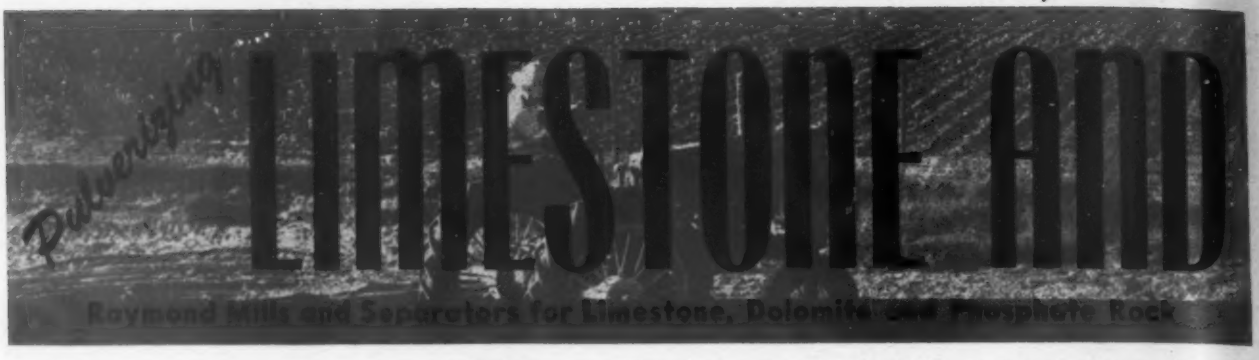


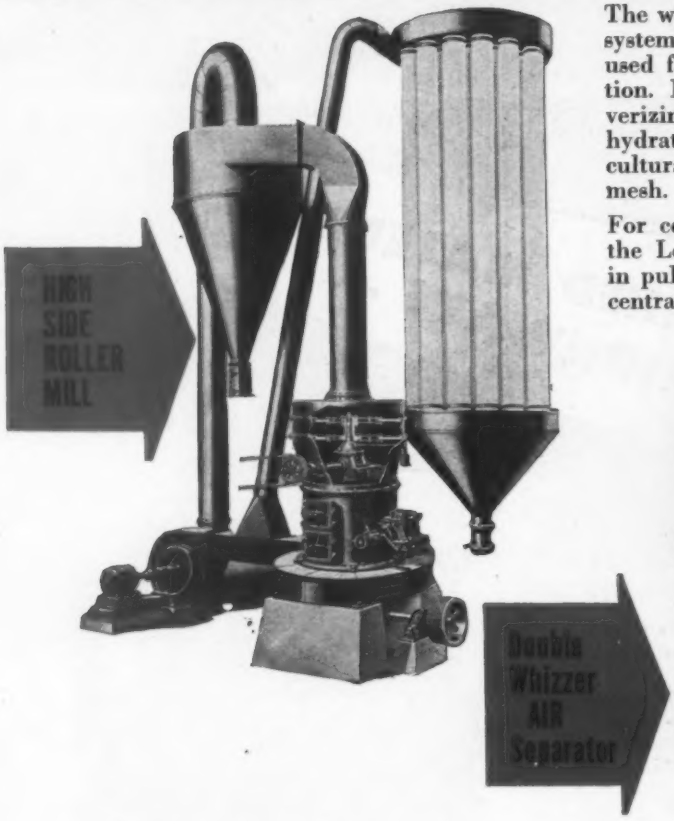
Meeting the demand for enormous quantities of proper materials required for future highway modernization programs is a problem with which many producers are faced. This is especially true in making the finer sizes of crushed stone or gravel needed for bituminous type highways for which there is a rapidly growing trend. If your plant is not equipped with a Symons Cone to make finely crushed materials in quantity and at low price, investigate the merits of this outstanding reduction crusher now used by progressive producers of stone, gravel and slag.



NORDBERG MFG. CO.
MILWAUKEE 7, WISCONSIN
NEW YORK • LOS ANGELES • WASHINGTON • LONDON • TORONTO • JOHANNESBURG

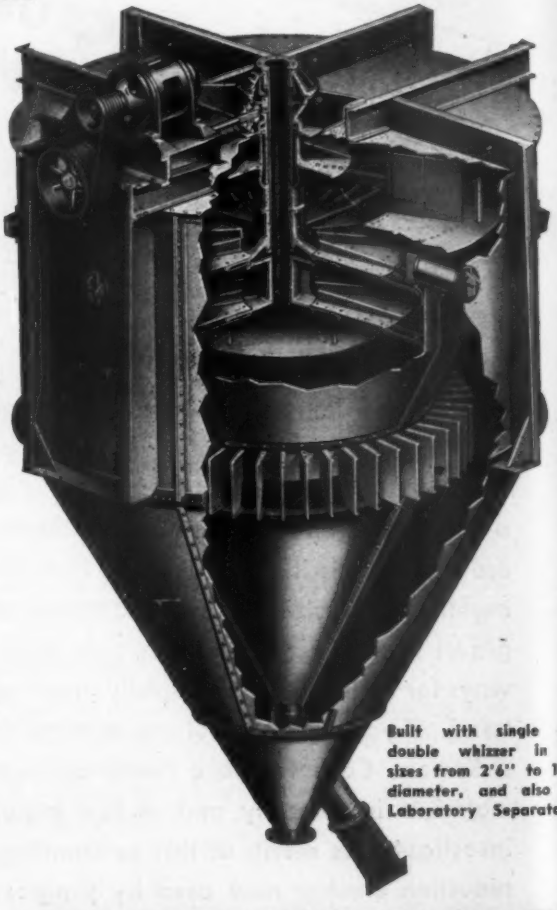
SYMONS CONE CRUSHERS





The whizzer-type Roller Mill, equipped with air drying system, saves time and eliminates separate dryers when used for drying and grinding limestone in *one* operation. It produces fine and uniform materials as in pulverizing burned dolomite from 50-mesh to 325-mesh; hydrated lime and limestone flour from coarse agricultural lime up to extreme fine filler materials at 325-mesh.

For coarser grinding up to about 100-mesh materials, the Low Side Roller Mill gives economical results as in pulverizing agstone and Florida pebble rock or concentrates.



Built with single or double whizzer in 9 sizes from 2'6" to 18' diameter, and also a Laboratory Separator.

The Raymond Mechanical Air Separator with patented whizzer is especially adapted for classifying hydrated lime, as the revolving whizzer blades tend to break up the soft lumps. This insures closer separation of the fines, cleaner tailings and increased output.

The use of the double whizzer with the slide damper control makes it possible to regulate the fineness so as to produce either the coarser grade of lime, or the superfine chemical hydrate at 99.5% through 325-mesh. The combination of the Whizzer Separator with an Automatic Pulverizer is an efficient method of producing an extremely fine and uniform finished material.

RAYMOND

Bulletins ON REQUEST

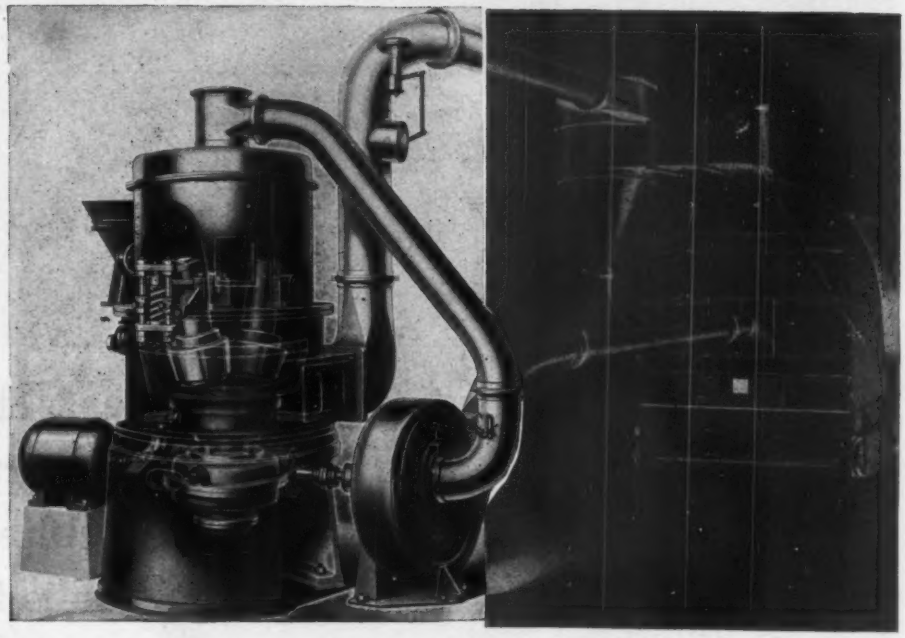
1307 North Branch Street, Chicago 22, Illinois

Sales Offices in Principal Cities

LIME PRODUCTS by Raymond

Improved Kiln Efficiency with Raymond Bowl Mill and Swing-Hammer Unit

Direct-firing a Rotary Kiln with Bowl Mill, automatically controlled



Maximum coal grinding efficiency is best obtained by using a mill that is developed especially for direct-firing operations. That is the Raymond BOWL MILL, the modern firing unit for rotary kilns, which has proved its economy by replacing many installations of fuel oil and natural gas.

Advantages:—(1) Uniform grind, at light or heavy load, on any grade or moisture coal. (2) Drying coal-in-the-mill while pulverizing. (3) Panel board control of several mills by single operator. (4) Quiet, vibrationless, dustless operation. Write for Bowl Mill catalog, No. 43.

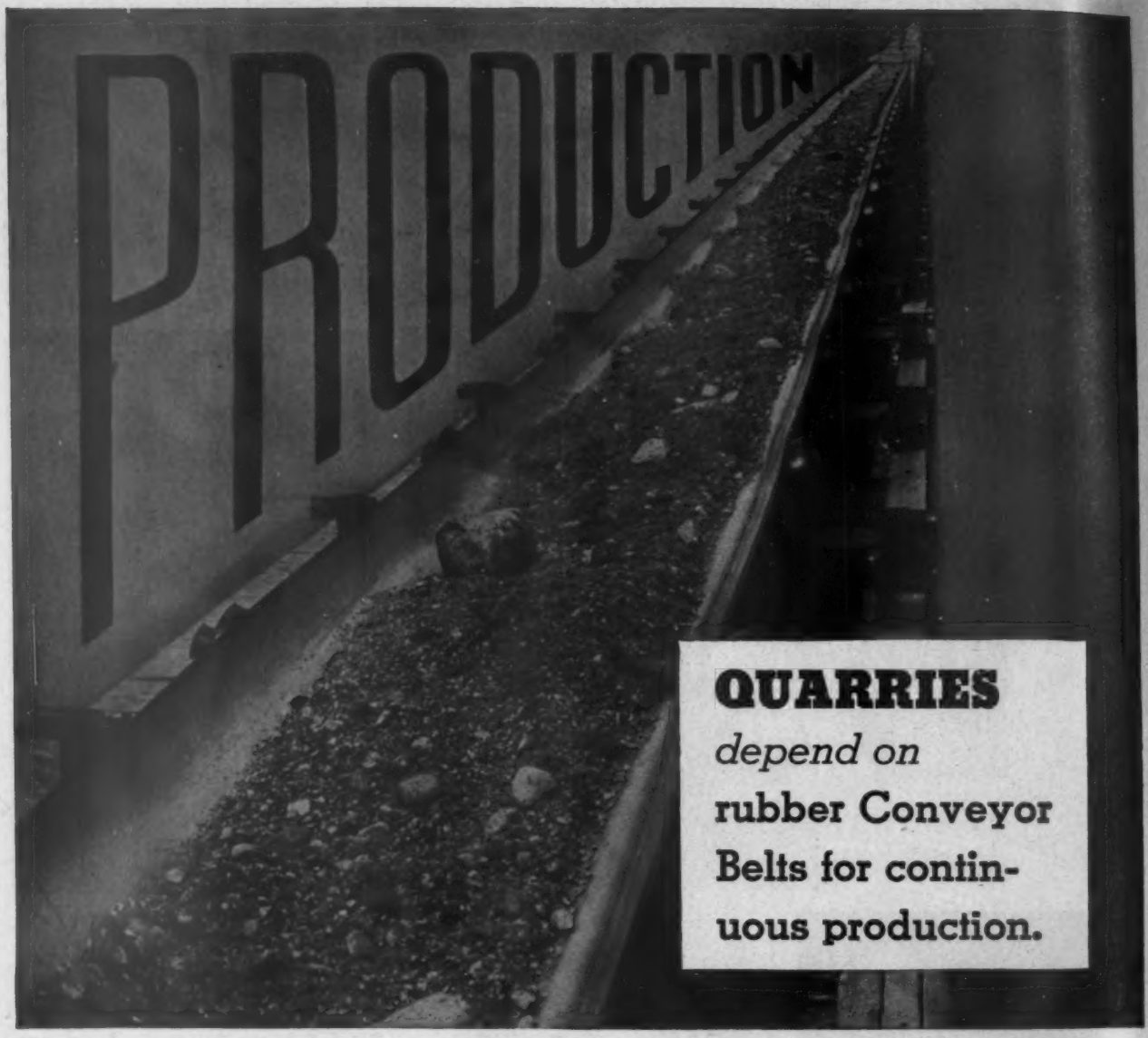


The Raymond Automatic Pulverizer, with whizzer separator, is a high speed swing-hammer mill, adapted for disintegrating the tailings discharged from the Mechanical Air Separator. It disintegrates the oversize particles, separates out the good lime and rejects impurities, classifying the product to uniform fineness.

PULVERIZER DIVISION

COMBUSTION ENGINEERING COMPANY, INC.

Canada: Combustion Engineering Corp., Ltd., Montreal



QUAKER Conveyor Belts

Are built to deliver thousands and thousands of tons of sand, gravel, crushed stone, cement and kindred products in this important industry... and that is exactly what they do. Quaker has been manufacturing Quality Conveyor Belting along with a complete line of Industrial Rubber Products for over sixty years.

Quaker Conveyor Belts are built of right materials, specially selected and compounded to deliver hard and long service. Experienced workmen follow every move in their construction during the entire period of manufacture including vulcanization. You really get a custom-made belt when you order a Quaker. More quarries are using Quaker Products today than ever before.

It is good policy to keep on asking for Quaker . . . the name that stands for Quality Industrial Rubber Goods.

QUAKER RUBBER CORPORATION

PHILADELPHIA 24, PA. • NEW YORK 7 • CLEVELAND 15 • CHICAGO 16 • HOUSTON 1

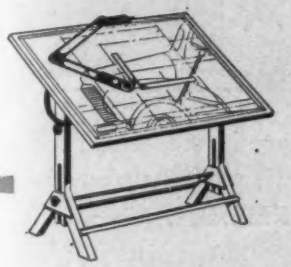
Western Territory

QUAKER PACIFIC RUBBER COMPANY • SAN FRANCISCO 5 • LOS ANGELES 21



Specification for

LONG TRUCK LIFE
LOW OPERATING COST



1. Go to your International Branch or Truck Dealer and say, "These are my loads. These are my routes. I want a truck that is strong enough and big enough to do my work."

2. Accept the recommendation you get. Here's why: The International Truck Line is complete. It includes a truck of the right type and carrying capacity for every job. International Branches and Dealers can recommend the right trucks without prejudice.

3. Set up a program of regular International service. The work is done by skilled mechanics, using special International equipment and factory-standard International parts. The service is supplied by International Dealers everywhere and by the nation's largest company-owned truck-service organization—International Branches.

Today's International Trucks are the best ever built. They represent more than 40 years of truck engineering and manufacturing experience. This engineering and manufacturing has long been so outstanding that in the last 15 years more heavy-duty Internationals have been purchased for commercial use than any other make.

So buy International—service International—and don't "under truck." That's the specification for long truck life and low operating cost.

Motor Truck Division
INTERNATIONAL HARVESTER COMPANY
180 North Michigan Avenue Chicago 1, Illinois

Listen to "Harvest of Stars" Every Sunday, 2 p.m. Eastern Time! NBC Network

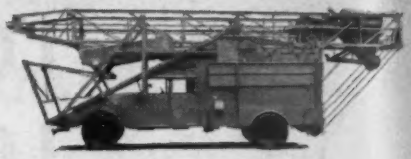
INTERNATIONAL

INTERNATIONAL *Trucks*

Mixermobile MIXES and HOISTS CONCRETE Like a Whirlwind



Folds up LIKE A GRASSHOPPER



If you are interested in cost saving and stepped up production, MIXERMOBILE is the answer! Here is what it will do:

Drive from the plant to the job and set-up for operation in 30 minutes after arrival by one competent man. Then it mixes and hoists 35 to 40 yards of concrete per hour . . . at a very low average cost per yard.

MIXERMOBILE has broken concrete pouring records on many war jobs. Now it is ready for immediate delivery for your postwar jobs.

Write DEPT. "RP" today for complete details and literature.

MIXERMOBILE MANUFACTURERS

6855 N.E. Halsey St. Portland 16, Oregon

SCOOPMOBILE • MIXERMOBILE • TOWERMOBILE

SPECIFICATIONS ALONE DO NOT MAKE A WORM GEAR

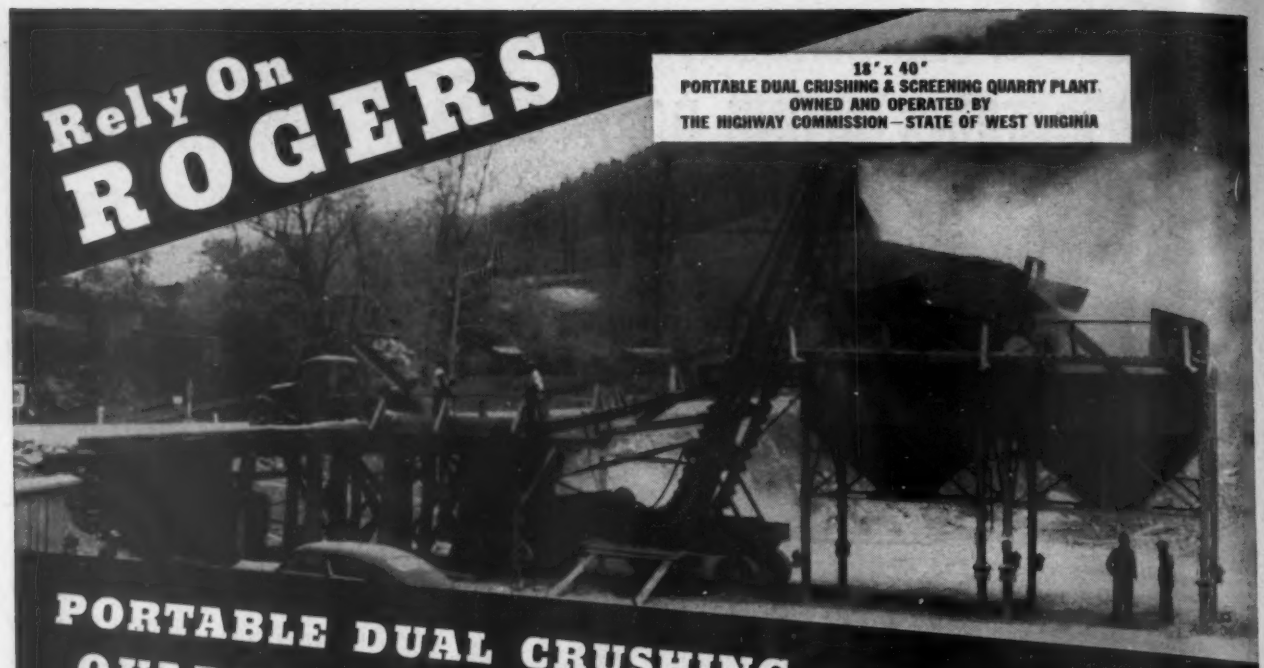


The extremely long life of De Laval Worm and Gear sets is due, in part, to the heat treatment to which the worms are subjected. Made from carefully selected alloy steel, De Laval worms are case hardened in the most modern, controlled atmosphere, forced convection, electric furnaces under careful metallurgical inspection and control. The heat treatment process employed provides a hard, uniform case and correct core structure of high tensile strength, free from internal stresses.

WG-2



Rely On ROGERS



18' x 40'
PORTABLE DUAL CRUSHING & SCREENING QUARRY PLANT
OWNED AND OPERATED BY
THE HIGHWAY COMMISSION—STATE OF WEST VIRGINIA

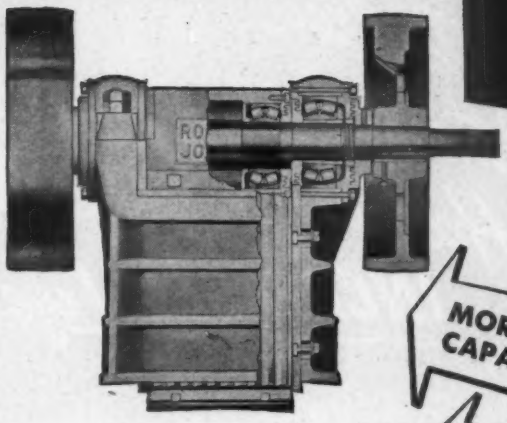
PORTABLE DUAL CRUSHING and SCREENING QUARRY PLANTS

For ON THE JOB ECONOMY and Unsurpassed Performance

The Rogers Dual Crushing and Screening Quarry Plant is another example of rock processing machinery that has made the name Rogers synonymous with lower operating and maintenance cost in crushing, sizing, conveying and storing . . . all over the world.

Fully portable and designed for complete crushing and screening on the job, the Rogers Portable Quarry Plant provides full, trouble-free processing at the most practical location. The thoroughness in construction combined with correctly engineered designs assures the extra strength, the year after year reliability that you can expect from either a single or complete plant built by Rogers.

When you rely on Rogers equipment, you can be certain that no part of your operations will be handicapped by the failure of one or more links in the process.



ROGERS JAW CRUSHERS

Despite greater capacity, there has never been a shaft or bearing failure reported in a Rogers Jaw Crusher because Rogers' thorough construction includes oversize shaft and anti-friction bearings. Available in 16 sizes—write for complete descriptive bulletin.

MORE CAPACITY

GREATER STRENGTH

UNLIMITED SERVICE

Rely On Rogers

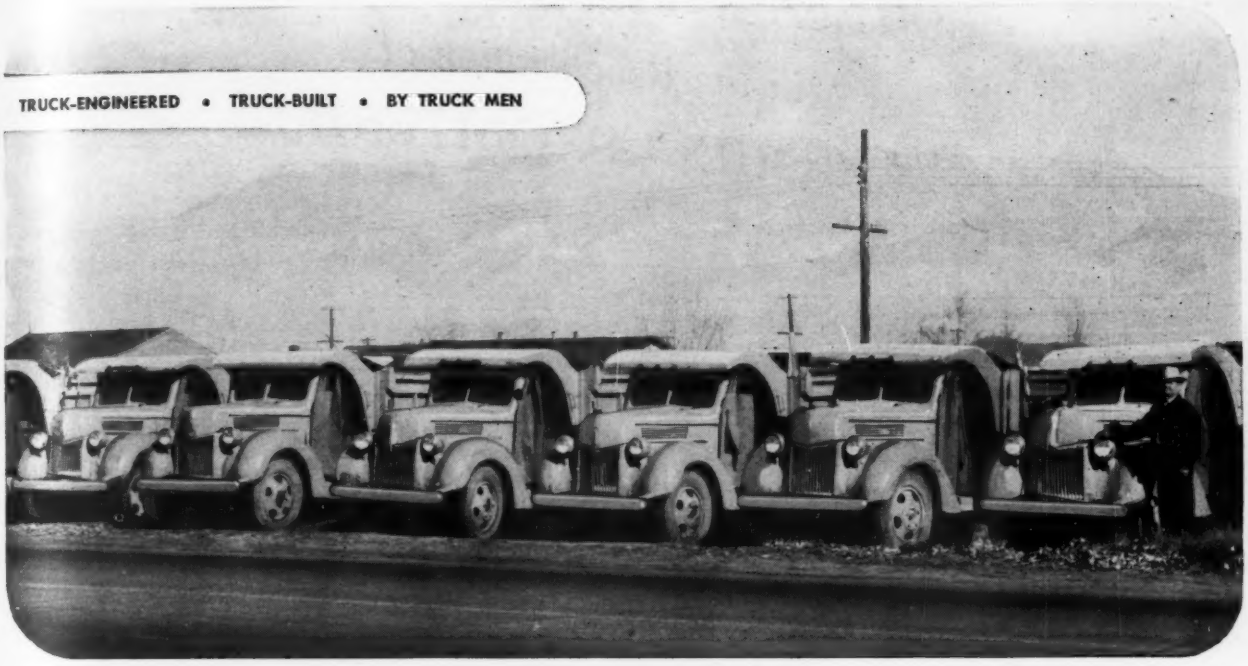
ROGERS IRON WORKS CO.

JOPLIN, MISSOURI



Quarry Plants • Gravel Plants • Jaw Crushers • Roll Crushers • Belt Conveyors • Bucket Elevators • Screens • Feeders • Steel Bins

Ford Trucks Last Longer



"MY 12 FORDS OUT-HAUL OTHER NEWER UNITS, AND AT LESS COST"

"I have hauled sand and gravel out of pits when other trucks have not been able to make it, in spite of the fact that my Fords carry a 40 per cent bigger bed than most of the others," wrote Mr. L. D. Alexander, of Albuquerque, New Mexico, not long ago.

"These twelve Ford 1½-ton Trucks have seen more than three years' service, and they're still more economical to operate than some newer models on the same job," Mr. Alexander continued. *"My equipment is ideal for hauling coal, also—which I do in the wintertime."*

The ample power and torque of Ford engines are big advantages which show up in pit work. And the rugged channel-reinforced frame construction and sturdy axle design for which Ford Trucks are noted prove their stamina under the shovel.

There's a Ford unit of 2-ton rating now, with two-speed axle and 8.25-20 dual rear tires. Heard about it? See your Ford Dealer! And ask him about the 32 new engineering advancements designed to save you money and make your new Ford Trucks last still longer!

Ford

FORD ADVANCED ENGINEERING!

THE FAMOUS V-8 ENGINE, for toughest service, now 100 HP, with NEW steel-cored Silvaloy rod bearings for trebled endurance • NEW Flightlight aluminum alloy 4-ring pistons for added oil economy • Tougher, rust-proofed valve springs • NEW moisture-sealed distributor • NEW coolant-saving radiator closure • Auto-balanced carburetion for still more thrifty power • Servicing simplified still further. And the rugged, thrifty 90 HP Ford six-cylinder engine, for stop-and-go jobs, with many important advancements, available in all except C.O.E. chassis.

Ford Truck rear axles—world-famous for load-lugging—provide generous reserve capacity • Light duty chassis have sturdy ¾-floating axles with triple-roller-bearing, straddle-mounted pinion; full-floating axles in all other chassis • 2-speed axle and vacuum power braking for 2-ton rating • Improved 4-speed transmission at extra cost in light duty chassis, standard in all others.

FORD TRUCKS

MORE FORD TRUCKS IN USE TODAY THAN ANY OTHER MAKE

The Application of "800 Series" Flotation Reagents in the Beneficiation of CERAMIC RAW MATERIALS

GLASS SAND

Problem: Reduction to less than 0.02% Fe_2O_3 of iron-bearing impurities mainly present as chlorite.

Results: Using Reagent 801 for flotation of iron minerals.

Product	% Weight	% Fe_2O_3 Analysis	% Fe_2O_3 Distribution
Feed	100.0	0.040	100.0
Concentrate (iron minerals)	6.58	0.424	69.6
Tailing (glass sand)	93.42	0.013	30.4

FELDSPAR ORE

Problem: Removal of biotite, tourmaline, garnet, iron oxides.

Results: Using Reagent 801 for flotation of iron minerals.

Product	% Weight	% Fe_2O_3 Analysis	% Fe_2O_3 Distribution
Feed	100.0	0.236	100.00
Concentrate (iron minerals)	9.55	2.16	87.38
Tailing (feldspar)	90.45	0.033	12.62

LOW GRADE FELDSPAR DUMP ORE

Problem: Production of glass spar by reducing the iron impurities mainly in the form of biotite and iron oxides.

Results: Using Reagent 801 for removal of iron; cationic collector for flotation of feldspar.

Product	% Weight	Analysis % Fe_2O_3	Analysis % Al_2O_3	Distribution % Fe_2O_3	Distribution % Al_2O_3
Feed	100.00	1.82	12.61	100.0	100.0
Concentrate (iron minerals)	16.1	10.59	16.66	93.96	21.33
Concentrate (feldspar)	56.1	0.12	17.16	3.85	76.21
Tailing	27.8	0.13	1.12	2.19	2.46

FELDSPAR ORE

Problem: To produce glass spar and silica sand suitable for use as glass sand, by removing iron impurities in the form of biotite, iron oxides, etc.

Results: Using Reagent 801 to float the iron minerals and a cationic type promoter to float the feldspar, leaving as a tailing a marketable-grade glass sand.

Product	% Weight	Analysis % Fe_2O_3	Analysis % Al_2O_3	Distribution % Fe_2O_3
Original Feed	100.00	0.506		100.0
Slimes (discard)	6.10	0.75		9.09
Flotation Feed	93.90	0.49		90.91
Concentrate #1 (Iron)	12.21	3.36	18-19%	81.23
Concentrate #2 (Feldspar)	59.36	0.07		8.30
Quartz Tailing	22.33	0.031		1.38

Developed principally for the treatment of Iron Ores and washery waste of the Mesabi, Cyanamid's new "800 Series" Reagents and new processes have practical applications in reducing iron-bearing impurities associated with Glass Sands and Feldspar and other minerals such as Kyanite, Sillimanite and Nepheline Syenite.

Typical results (left) illustrate the effectiveness of "800 Series" Cyanamid Reagents. But these are merely indicative of potential applications in non-sulphide flotation where selective reagents and economical, effective processes are required to treat low-value non-metallics.

AMERICAN CYANAMID COMPANY PRODUCT

TYPICAL NON-METALLIC and METALLIC OXIDE MINERALS that can now be Beneficiated by Processes and Reagents Offered by Cyanamid

- BARITE
- CEMENT ROCK MINERALS
- COAL
- FELDSPAR
- FLUORSPAR
- GARNET
- GLASS SANDS
- GRAPHITE
- GYPSUM
- ILMENITE
- IRON ORE
- KYANITE
- MAGNESITE
- NEPHELINE SYENITE
- OLIVINE
- PHOSPHATE ROCK
- SILLIMANITE
- SCHEELITE
- SPODUMENE
- WOLFRAMITE

For the past several years a considerable part of the personnel and resources of the Cyanamid Mineral Dressing Laboratory has been focused upon non-metallic mineral beneficiation. Many thousands of hours of pure and applied research have been devoted to the search for new low-cost reagents and the development of processes for their effective use.

For the beneficiation of non-metallic minerals at a size coarser than can be treated by froth flotation, Heavy-Media Separation Processes offered by Cyanamid can be used either as a pre-concentration step or for the production of marketable products. These processes, already in large-scale use in a number of plants, are successfully separating valuable non-metallic minerals from gangue, although the difference in their specific gravities may be as low as 0.05.

What we have learned about efficient non-metallic beneficiation is freely available to interested metallurgists through Cyanamid Field Engineers. Your inquiry will have prompt, intelligent and completely confidential handling.

Shown below is the Fagergren Flotation Machine (direct mechanical type) which together with the Steffensen Flotation Machine (free-air type) is offered by Cyanamid for the more efficient beneficiation of Ceramic Raw Materials. Information on these machines will be sent upon request.



AMERICAN CYANAM
30 Rockefeller Plaza, Ne



MICHIGAN *Mobile* SHOVEL-CRANE

You can count on your operator maintaining high output rates with a MICHIGAN. It's fast-moving—both on the road and on the job. It's easy to handle, it's economical to operate. That's why it ranks so high in the estimation of operators and owners alike. With operators because its air controlled clutches respond instantaneously and smoothly to the touch of a finger. With owners because it gets every job done sooner, at minimum cost.

FULLY CONVERTIBLE
⅜ YD. and ½ YD. SHOVELS,
6 to 12 TON CRANES
•
FINGERTIP AIR CONTROLS
•
ONE-MAN OPERATION
•
TRUCK MOBILITY

Complete information and specifications on MICHIGAN Mobile SHOVEL-CRANES is available on request. Ask for Bulletin RP66.

MICHIGAN
POWER SHOVEL COMPANY
BENTON HARBOR, MICHIGAN

Half a Century of Truck Progress... A PICTURE HISTORY



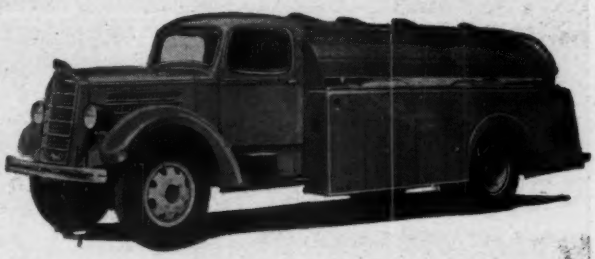
1906 The first Mack commercial gasoline vehicle was delivered in **1900**. It operated as a bus and later as a truck for 17 years. By 1906, the automotive industry's tenth birthday, Mack trucks had many advanced features, including the "high cab" (above), granddaddy of today's cab-over-engine design.



1916 Ten years later came the famous AC "bulldog" model which made the phrase "built like a Mack truck" a popular synonym for rugged strength. You can still see many of these trucks grinding along through city streets, steadfastly making money for their owners and looking quite at home in modern traffic.



1926 More powerful engines were being used, and by 1926 pneumatic tires were fast displacing solids and making possible greater road speeds. These progressive trends, plus certain exclusive refinements of Mack engineering, were embodied in the Mack AB.



1936 An important milestone in truck history was the introduction, in 1936, of the now widely-used Mack EH—a model which surpassed anything previously attained in truck performance.



1946 Today, with World War II experience crowning its 46 years of production, Mack again takes the lead in building the world's hardest-working trucks . . . *trucks which set industry standards for stamina, performance, economy and long life.*

The Automotive Industry's 50th Anniversary is Mack's 46th

Mack

TRUCKS

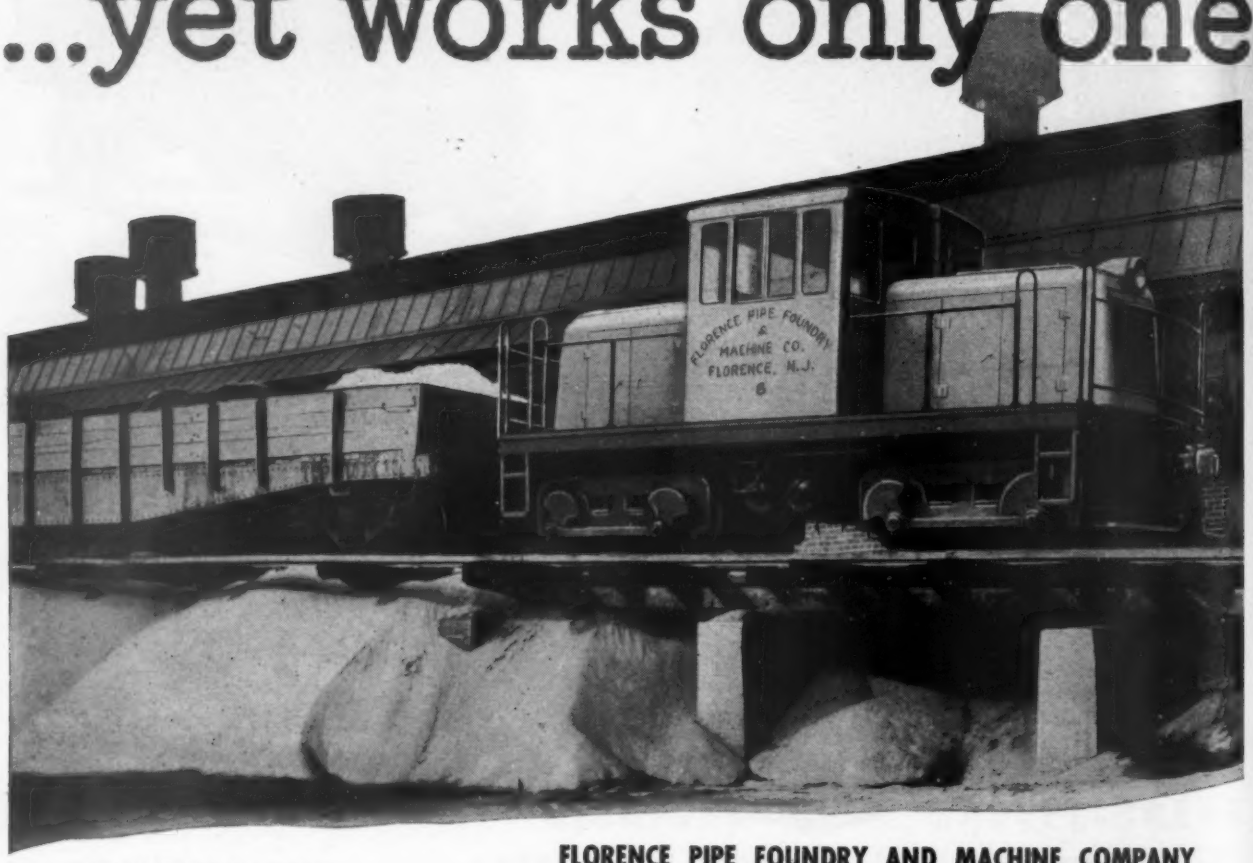
FOR EVERY PURPOSE



Mack Trucks, Inc., Empire State Building, New York, N. Y. Factories at Allentown, Pa.; Plainfield, N. J.; New Brunswick, N. J.; Long Island City, N. Y. Factory branches and dealers in all principal cities including Toronto and Montreal, Canada.

PERFORMANCE COUNTS!

G-E diesel-electric ...yet works only one



This G-E diesel-electric handles all switching and hauling at Florence plant.

FLORENCE PIPE FOUNDRY AND MACHINE COMPANY IS PROFITING WITH G-E DIESEL-ELECTRICS

Advantages of G-E diesel-electrics

Availability 90 per cent up.

Fuel costs only fraction of that of steam locomotive.

Operates several days without refueling.

Maintenance expense is greatly reduced.

Ideal for use around buildings because it gives off no smoke nor harmful exhaust gas.

Smooth, even torque at driving wheel rims is easy on track.

Florence Pipe operating results for first six months

Diesel-electric has nearly 100 per-cent availability.

Fuel costs average $23.71 a month against $160.00 for steamer.

Fueling time cut 87 per cent.

Maintenance costs reduced 88 per cent.

Diesel-electric is used in machine shop, with no employee complaints.

Marked reduction in track maintenance expense.

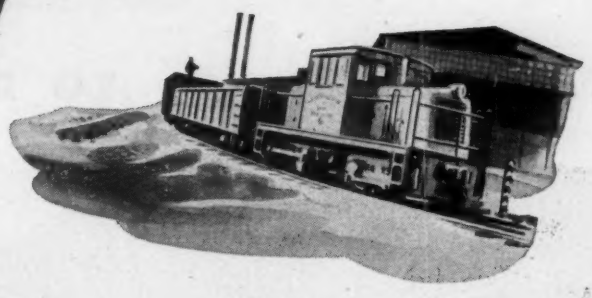
diesel-electric *Industrial* LOCOMOTIVES



A standard line—built for stock—quick delivery—low cost

saves $400 a month

shift a day



A 45-ton G-E diesel-electric replaced a 55-ton steam locomotive last July at the Florence Pipe Foundry & Machine Co., Florence, N. J. In the diesel-electric's first six months of service, the company's records show a saving of over $2400 in operating costs alone, or at the rate of nearly 20 per cent per year on the purchase price!

The diesel-electric switches all incoming and outgoing railway cars, and handles intra-plant movement of raw materials and finished products. In addition it hauls slag to the dump two miles away, readily pulling twelve cars of slag, weighing 35 to 40 tons each, up a two per-cent grade. It easily pushes 80-ton loads of sand or coke to the loading trestle, the approach to which combines an eight per-cent grade with a 400-foot radius curve.

The diesel-electric requires but one half-hour a week for inspection and oiling. Except for this, it has had 100-per-cent availability, as compared with five or six hours per week required for the steamer.

Your switching and haulage operations may be different from those at Florence, but one of the five standard sizes of G-E diesel-electrics will meet your needs just as efficiently and economically. Why not have a G-E engineer make a survey of your particular requirements and submit cost data?

APPARATUS DEPARTMENT

GENERAL ELECTRIC

SCHENECTADY, N. Y.

120-24-9505

PICK OUT A "TOUGH" JOB . . . .

THEN PICK A GENERAL . . . . . .

. . . . . TO DO THAT JOB

faster

. . . . . .

better

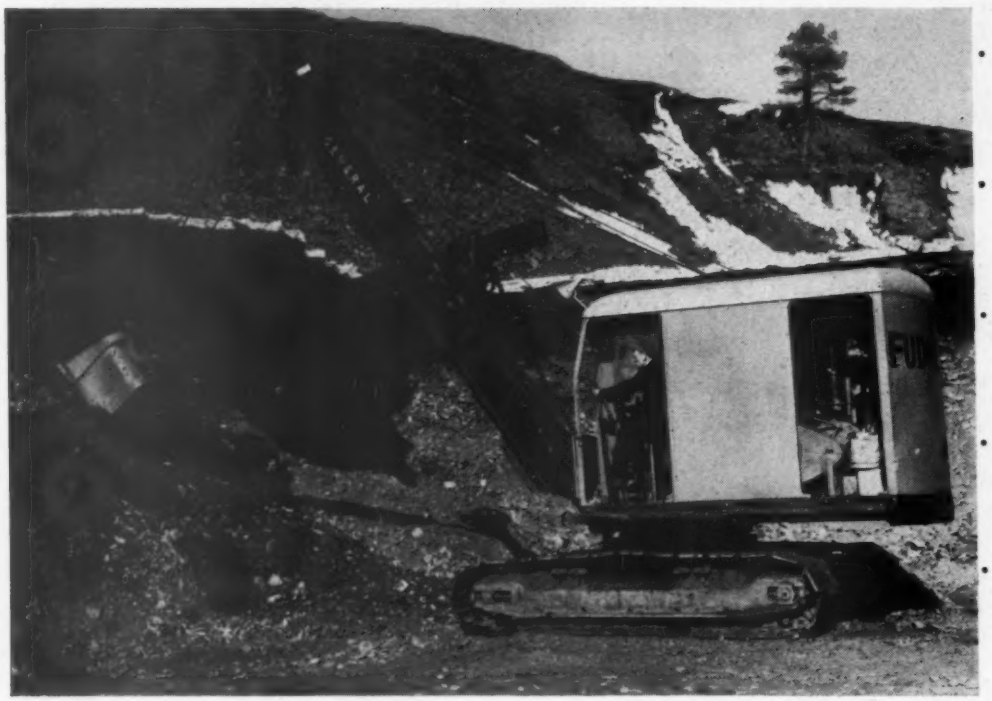
. . . . . .

cheaper

. . . . . .

. . . . . .

. . . . . .



You know the kind . . . that job on which you've never been able to get production up where you'd like it . . . the one that's been "raising Ned" with your present equipment! That's the kind of a job where a GENERAL really stands out!

You've got a job like that . . . where operating conditions are especially bad . . . where usage is exceptionally severe. The record proves that GENERALS can take punishment, day after day, and still turn in a creditable performance: 98% OF ALL THE GENERAL MACHINES EVER BUILT ARE STILL IN SERVICE! That's a record worth thinking about in planning the purchase of new equipment. It's a record that proves a GENERAL can handle *your* job—faster, better, cheaper. See your nearest distributor or write to us direct today for the complete details . . . you'll find them both interesting and helpful.

THE OSGOOD COMPANY
SHOVELS, DRAGLINES
CRANES
CRAWLER & WHEEL MOUNTS
DIESEL, OIL, GAS, ELECTRIC

Associated with The Osgood Company

GENERAL EXCAVATOR CO.

MARION, OHIO

GENERAL
CRANES, DRAGLINES
AND SHOVELS
DIESEL, GAS, ELECTRIC



Plain Primacord — for shallow holes and all surface trunk lines.

Reinforced Primacord — for deep, rugged holes where extra tensile strength and resistance to abrasion are needed.

Wire Countered Primacord — for extremely rugged, deep holes where maximum resistance to abrasion is important.

Select the type of Primacord best suited to your particular job. Then use it, and *forget* the dangers of stray currents from electrical storms and power lines. For with Primacord — and Primacord alone — no cap *ever* goes into the hole . . . no cap is *ever* attached until just before the blast.

Consider, too, these other advantages you get with Primacord . . .

- A tried and proved time delay feature for more efficient shot sequence.
- In a properly loaded hole the Primacord is in contact with every cartridge. This direct detonation minimizes the chance for unexploded powder left in the rock pile.
- The light weight of Primacord makes for easier handling on the job.
- A system for faster hooking-up with square knots and half hitches, in plain sight, makes for easy hook-up inspection.

It's easy to see why Primacord with all these advantages is still the recognized favorite with pit and quarry operators everywhere.

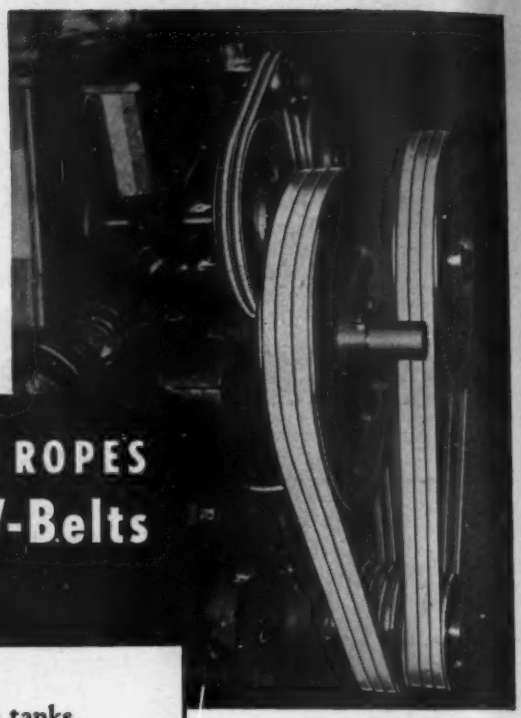


P-19

THE ENSIGN-BICKFORD COMPANY · Simsbury, Connecticut

PRIMACORD-BICKFORD Detonating •Fuse•

Here's an important fact



GATES *Standard* VULCO ROPES
are TODAY *Outwearing* any V-Belts
Ever Built Before!

The simple fact that during the war our Army's tanks, tractors and self-propelled big guns required V-belts of a strength and durability never thought possible before is bringing substantial benefits to Gates V-belt users today. That is because Gates developed these greatly superior V-belts for our combat units—and here is why this fact is now important to YOU:—

with this simple reason behind it

Every improvement developed by Gates for U. S. Combat Units— and many later improvements, also—have been added, day by day, to the quality of the Standard Gates Vulco Ropes which have been delivered to you.

As a result, *long before the war was over,* you were getting in your Standard Gates Vulco Ropes a product built to far higher service standards than any V-belts ever built by anyone before the war.

And the improvement by no means ended there. Through continuing *specialized* research, the service qualities of these superior Gates Vulco Ropes have been still further improved as all of Gates facilities and energies have been returned to the service of industry.

These are the simple reasons why the standard Gates Vulco Ropes you are getting today are delivering far better service than any V-belts ever built before!

THE GATES RUBBER COMPANY
DENVER, Colorado
World's Largest Makers of V-Belts

All Gates V-Belts are Built With The Patented CONCAVE SIDE



Gates
THE MARK OF SPECIALIZED RESEARCH

466

GATES VULCO ROPE DRIVES

Engineering Offices and Jobber Stocks **IN ALL INDUSTRIAL CENTERS** of the U. S. and 71 Foreign Countries

BUDA one-sixty-one DIESEL

. . . reliable power at 1/3 the cost!



BUDA One-Sixty-One Diesel Model 6-DC-844

the engines that Experience built...

TAKING time out to figure operating costs of their new BUDA DIESEL powered shovel, a large midwest operator was more than satisfied to find that the new machine not only out-performed other units, but operated at "one-third the cost of steam."

Service records of BUDA DIESEL powered construction, quarry and mining equipment all over the country are proving every day that these modern "ONE-SIXTY-ONE" SERIES engines are tops for economy and dependability.

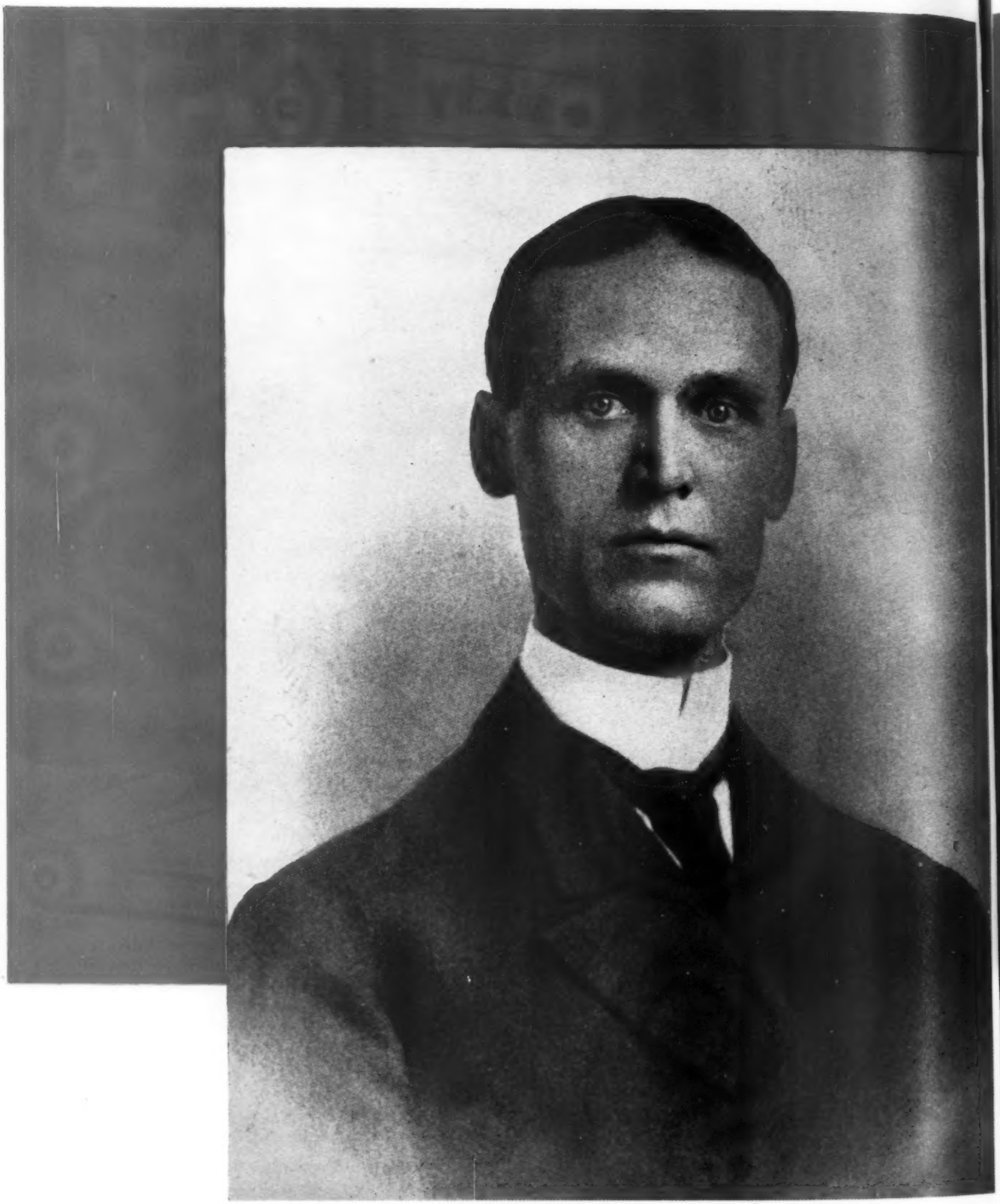
Be sure your new equipment is BUDA powered.



There is a BUDA Distributor near you . . . enlist his aid in solving your power problems.

BUDA

15428 Commercial Avenue
HARVEY (Chicago Suburb) ILLINOIS



The late Adelmer M. Bates . . . Inventor of the Bates Valve Bag.



3,027,001,000

multiwall paper bags (94 lb.) have been used by the Cement Industry since their introduction by Adelmer M. Bates in 1924.

Laid end-to-end these bags would reach around the world fifty-three times.

Since 1929 when Bates Valve Bag Company became a division of St. Regis Paper Company, the Company has recognized its responsibility in carrying forward the magnificent achievements of the late A. M. Bates in the field of industrial packaging. The technical development staff of St. Regis is working constantly toward the betterment of multiwall bags and the improvement of packers for the economical, efficient packaging of cement and other rock products.

St. Regis MULTIWALL PAPER BAGS

MULTIPLY PROTECTION • MULTIPLY SALEABILITY

ST. REGIS SALES CORPORATION

(Sales Subsidiary of St. Regis Paper Company)

NEW YORK 17: 230 Park Ave. CHICAGO 1: 230 No. Michigan Ave.
BALTIMORE 2: 2601 O'Sullivan Bldg. SAN FRANCISCO 4: 1 Montgomery St.

IN CANADA
St. Regis Paper Co. (Can.) Ltd.
Vancouver, British Columbia
Montreal, Quebec

Birmingham Boston Cleveland Dallas Denver Detroit Franklin, Va. Los Angeles
Nazareth, Pa. New Orleans No. Kansas City, Mo. Ocala, Fla. Oswego, N. Y. Seattle Toledo

LIKE A CHAMPION MARKSMAN..



FORM-SET ROPE IS *Relaxed*

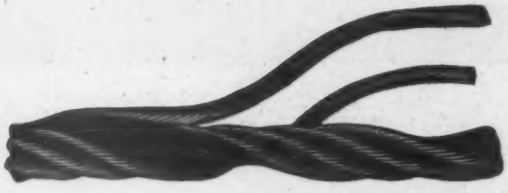
The sharpshooting rifleman can't afford tension. Watch him as he sights on the bull's-eye. Keen, alert, a study in concentration, he's nevertheless relaxed. The slightest twitch or jerk as the trigger is squeezed would throw him off line.

Much of that same relaxed effect is present in Form-Set rope—Bethlehem's preformed. Wires and strands have been helically shaped in advance, before being laid in the rope. They retain this helical shape; they have no urge to uncoil. This is because the preforming process coaxes the tension from each individual strand.

Broken Form-Set wires lie perfectly flat; they don't bush out to snag on hands or clothes. You can see for yourself by cutting some Form-Set rope. No flying apart at the ends. You have to *lift* each strand or wire to get it apart from its mates.

But the most valuable feature of preformed rope is its great flexibility. Being relaxed, it naturally bends more easily over your sheaves and drums. This means far less bending fatigue . . . and that, in turn, means longer life . . . greater economy.

Every grade, size, and type of Bethlehem wire rope is available in the Form-Set construction. Get full particulars from the nearest Bethlehem office or distributor.



A cut section of Form-Set rope. The strands have been purposely lifted apart. They can't spring up by themselves, for the tension, the urge to uncoil, has been removed by preforming.

When you think WIRE ROPE



think BETHLEHEM

Superior
DIESELS

. . . . will give you
consistent power profit



One of 7 Superior Diesels, Columbia Quarry, Krause, Ill.

with a minimum of upkeep

Superior ENGINES

SUPERIOR DIESELS • MARINE • STATIONARY • LOCOMOTIVE

Division of THE NATIONAL SUPPLY CO., Plant and General Sales Office: Springfield, Ohio

How BG *Bucket Loaders* screen to size while loading..



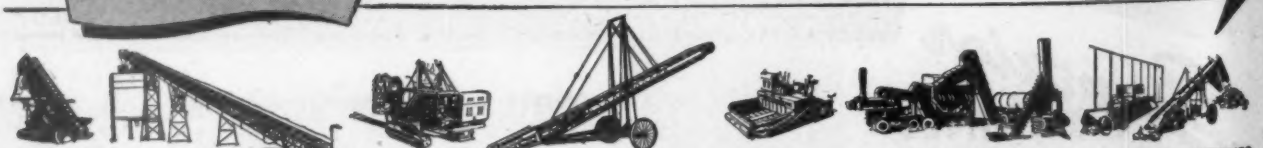
• Screening and loading become one continuous operation with the Barber-Greene Bucket Loader. One machine and one operator do the entire job. The double deck vibrating screen operates right on the loader and moves with the loader, requiring no change of set-up as the working face progresses.

In addition, bank run material is loaded at the time and in the quantities actually needed. There are no piles of screened material scattered around to be run over by trucks and lost.

Barber-Greene Bucket Loaders, built in several different models and sizes, are designed to operate with scalping and vibrating screens and other accessories. Write for Catalog No. 82, which illustrates and describes the mechanical features of the loaders and their accessories. Barber-Greene Company, Aurora, Illinois.



BG **Barber-Greene** CONSTANT FLOW EQUIPMENT

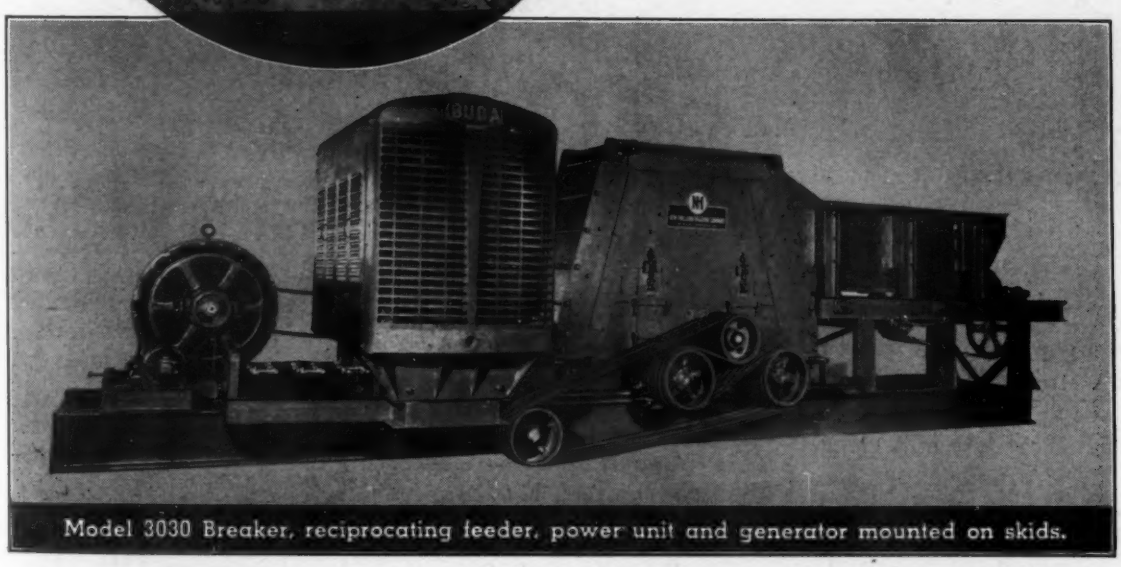


LOADERS • PERMANENT CONVEYORS • DITCHERS • PORTABLE CONVEYORS • FINISHERS • BITUMINOUS PLANTS • COAL MACHINES

HIGH PERFORMANCE LEVEL



Impact action of twin impellers reduces run-of-quarry stone as large as 30 inch to minus one inch . . . at the rate of 100 to 150 tons per hour with from 100 to 150 H.P.



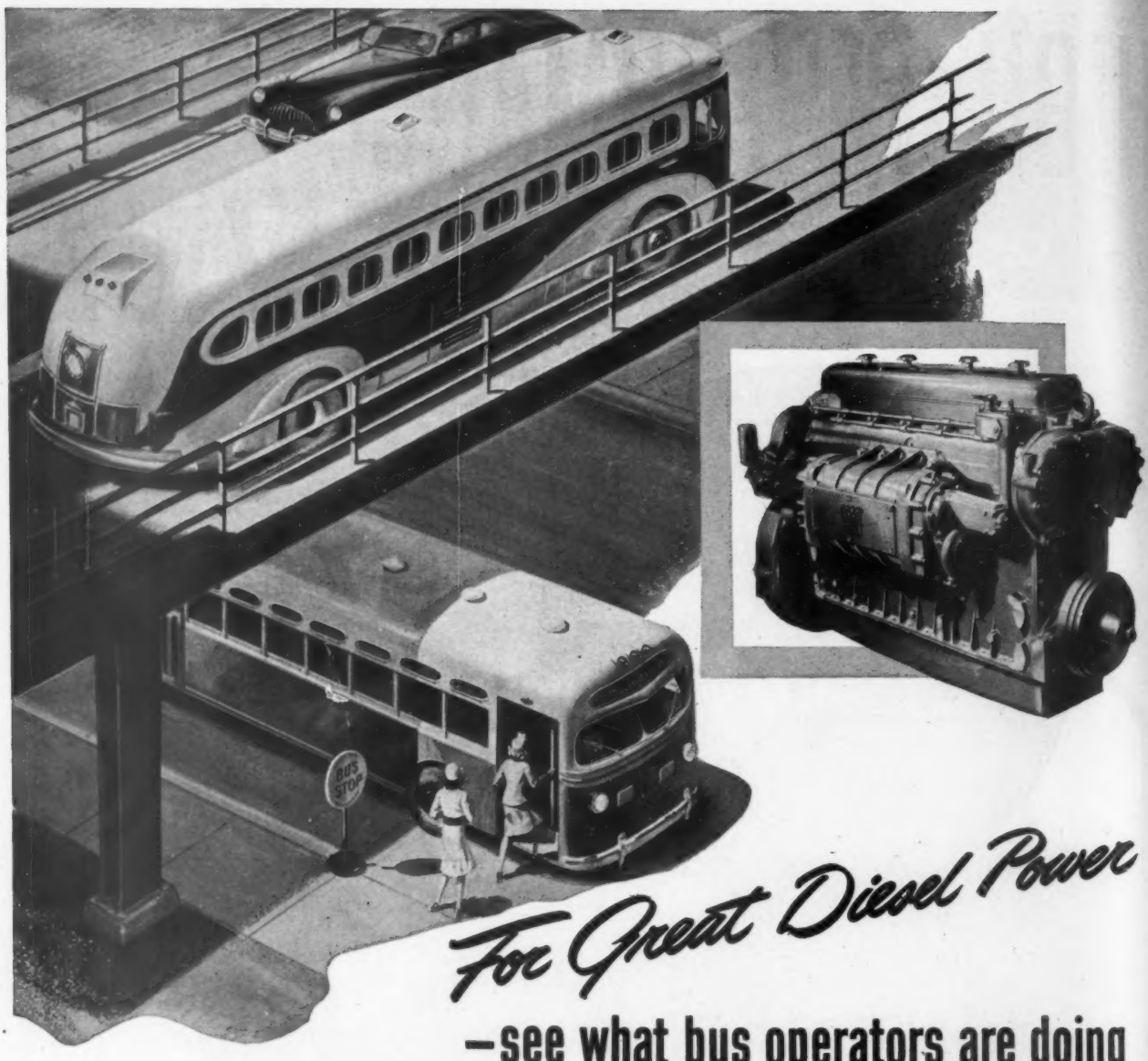
Model 3030 Breaker, reciprocating feeder, power unit and generator mounted on skids.

NEW HOLLAND MODEL 3030 DOUBLE IMPELLER BREAKER

The revolutionary modern operating principle of the model 3030 is setting new high standards of production. An ideal unit for the low cost production of various sized road rock and concrete aggregate, it is easily adaptable for ag-lime.

For complete factual data, write Dept. E-1, Industrial Division.

NEW HOLLAND MACHINE COMPANY
NEW HOLLAND, PENNSYLVANIA



For Great Diesel Power

—see what bus operators are doing

LITERALLY thousands of GM Diesel-powered buses are on America's streets and highways. Many have traveled more than a million miles and are still going strong. They're pulling upgrade smoother, making better time and getting over 50% more miles per gallon, using low-cost fuel.

Because they're powerful and compact, these engines have made it possible for buses to take advantage of all the economy and dependability of Diesel power.

And they can bring these advantages to countless users of power who haven't been able to consider Diesel before.

Whatever needs for power you may have in road-making machinery, cranes, shovels or any other construction material — look to GM Diesels.

Features of GM Diesels Important to Every User of Power

- ***QUICK TO START*** on their own fuel
- ***LOW COST***—run on common fuel oil
- ***EASY TO MAINTAIN***—clean design plus accessibility
- ***LESS FIRE HAZARD***—no volatile explosive fuel
- ***COMPACT***—readily adaptable to any installation
- ***SMOOTH OPERATION***—rotating and reciprocating forces completely balanced
- ***QUICK ACCELERATION***—2-cycle principle produces power with every downward piston stroke

GM
GENERAL MOTORS
DIESEL POWER

DETROIT DIESEL ENGINE DIVISION
DETROIT 23, MICH. • { SINGLE ENGINES . . Up to 200 H.P. / MULTIPLE UNITS . . Up to 800 H.P.
GENERAL MOTORS



Contractors: Order the equipment you need NOW! Be ready to handle construction at a profit

Factories are speeding production in an effort to supply the construction equipment needed to handle the work which lies ahead. The contractors who are properly equipped with the necessary machinery and tools are the ones who will complete their contracts most profitably.

Practically every contractor needs construction equipment of one type or another . . . and when you buy equipment, LET C.I.T. FURNISH THE MONEY. Conserve your operating funds for supplies, pay rolls, all of the expenses necessary to operate freely. Spread the cost over many months . . . let the equipment help pay its own way out of earning capacity.

To finance purchases of equipment this is all you need to do: Select whatever equipment you need . . . several pieces can be financed at one time . . . agree with the sellers on prices and terms . . . then give C.I.T. the seller's name, types of equipment purchased, tell us the amount to be financed and how you want to pay for it.

We will attend to all further details and when the equipment is ready for delivery, a C.I.T. check will conclude the transaction. You will obtain prompt action and will be quoted a uniformly low rate for the use of our funds.

Any of these offices are at your service. Write, wire or call.

ONE PARK AVENUE
NEW YORK

•

660 Market Street
SAN FRANCISCO

333 N. Michigan Avenue
CHICAGO

•

416 West 8th Street
LOS ANGELES

The Mark of LEADERSHIP

C.I.T. CORPORATION

INDUSTRIAL FINANCING

In Canada: CANADIAN ACCEPTANCE CORPORATION *Limited, Metropolitan Building, Toronto, Canada*

AFFILIATED WITH COMMERCIAL INVESTMENT TRUST INCORPORATED

Generally Speaking

June 1, 1946

Dear Reader:

Under the latest order of National Housing Expediter Wilson W. Wyatt, certain definite percentages of new housing construction will be apportioned into rental units and low-cost homes, making allowances for geographical differences in construction costs. The order determines maximum costs in each bracket through a "dividing line" technique which is based on local builders construction estimates for the first quarter of this year. One purpose back of this order is to obtain more rental construction units. Most veterans cannot afford to build a home.

* * * * * * * * * * *

An employer cannot safely disregard seniority provisions of his company's union contract in making a decision on whether to lay off a veteran instead of a non-veteran.

* * * * * * * * * * *

A call for bids for the erection of Angostura dam, on the Cheyenne River, was announced recently by the Bureau of Reclamation, the first South Dakota unit of the huge Missouri Basin project. The structure will be a concrete gravity type dam with a height of 150 ft. above the river bed, and a crest length of approximately 1600 ft. About 250,000 cu. yd. of concrete will be required for the construction of the dam.

* * * * * * * * * * *

According to the Producers' Council, there is enough plant capacity for building materials not only to meet the emergency housing building program in 1946 but also to permit 9 billion dollars of other types of construction.

* * * * * * * * * * *

The first postwar housing development in the nation to feature radiant heating now is nearing completion in Pittsburgh, Penna., where 33 one-floor plan five and six-room houses are being built. Foundations will comprise concrete footings topped by a 3-in. course of concrete blocks. Inside the perimeter, a gravel fill, ranging from 6 in. to 8 in. deep, in accordance with drainage requirements, is spread. The heating coils are positioned on the gravel fill, welded together and tested, and then a 5-in. reinforced concrete floor slab is poured.

* * * * * * * * * * *

In the New Brunswick, N. J., area the first of 50 new type concrete houses are now being built by A. J. O'Brien, New York, N. Y. Concrete is pumped into sectional steel wall forms to produce foundations, floors, exterior and interior walls. Slag is used for the aggregate in the mix. Roofs are constructed with light steel channel beams spaced to receive precast concrete roof slabs with sufficient depth of "nailcrete" so that any desired roofing can be attached.

* * * * * * * * * * *

California is on the search for mineral resources to support industry. The Los Angeles Chamber of Commerce has arranged for a comprehensive survey of local mineral resources used in chemical production.

* * * * * * * * * * *

Plans for $20,000,000 of flood control improvements to thwart the periodic rampages of two Delaware river tributaries, the Lehigh and the Lackawaxen rivers, were detailed at the spring meeting of the American Society of Engineers.

(Continued on page 5)

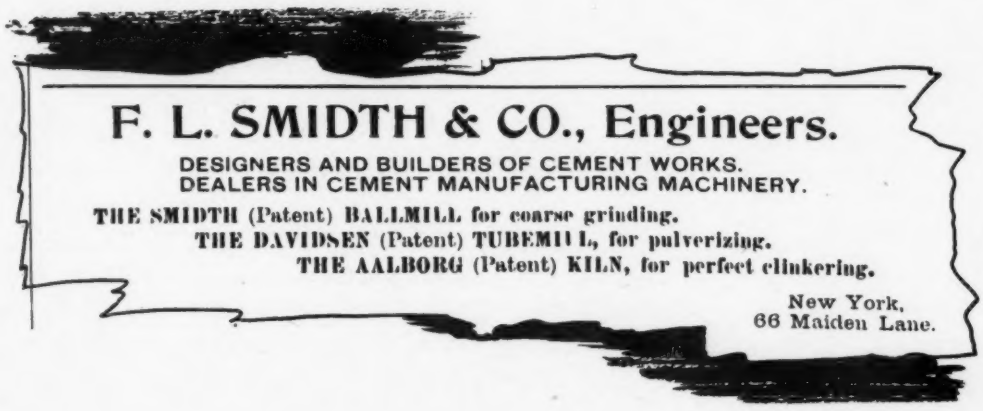
Fiftieth Anniversary

As this issue of "ROCK PRODUCTS" commemorates its Fiftieth Anniversary, we take the liberty as one quinquagenarian to another of repeating our own Fiftieth Anniversary notice and to express to "Rock Products" our sincere congratulations on its half century of progress and our compliments for the fine work it has done for the industries it covers.

In November, 1895, F. L. SMIDTH & CO. was incorporated in the United States under the laws of the State of New Jersey.

During these fifty years, F. L. SMIDTH & CO. devoted their efforts to engineering in the cement and allied industries, and the design and manufacture of grinding and calcining machinery with accessories for use in those industries.

Reproduced below is one of their early advertisements of half a century ago.

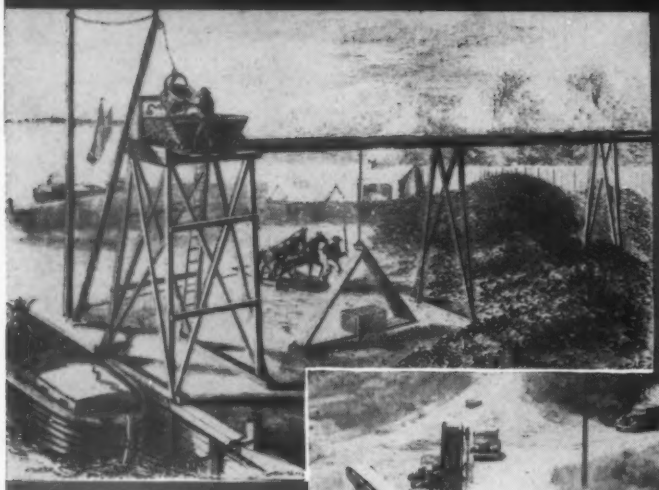


We wish to thank our many friends, who through their confidence in our engineering and machinery, have made possible our great growth and success over the past 50 years and we express to them our deep appreciation.

F. L. SMIDTH & CO.

11 WEST 42ND STREET ENGINEERS NEW YORK, N. Y.

Thermoid —For Progress in American Industry



Bulk Materials Handling in 1872. Getting coal from barge to coal yard involved tedious hand shoveling, team and teamster, derrick, pulleys, tracks, counterweights and a great deal of time.

from the Bettman Archive



Modern Methods with Thermoid. Sand, gravel, crushed stone, coal — any kind of bulk material is speedily and effortlessly moved from pit, mine, ship or storage bin with loading machinery equipped with durable Thermoid belting.

IN most large-scale production plants mechanical transportation of materials in process is replacing costly, cumbersome, laborious manual methods. The result: greater production, better working conditions, fewer accidents, reduced costs.

In outdoor extractive industries and in factories, Thermoid has contributed to this progress through the development of conveyor belting to meet the special requirements of different companies. Consultation with a Thermoid representative may develop ways to help you improve processes and reduce costs.

Since 1880, in problems involving hose, belting and friction materials, industrialists have found *it's good business to do business with Thermoid.*

THE THERMOID LINE INCLUDES: Transmission Belting • V-Belts and Drives • Conveyor Belting • Elevator Belting • Wrapped and Molded Hose • Sheet Packings • Industrial Brake Linings and Friction Products • Molded Hard Rubber and Plastic Products.

Thermoid Rubber

DIVISION OF THERMOID COMPANY

TRENTON 8, NEW JERSEY

Contributor to Industrial Advancement Since 1880





(Continued from page 54)

New uses for asbestos are constantly being developed. Asbeston, a U. S. Rubber material, is now being used as a fire-resisting cover for the rolls of home electric ironers. A heating pad made by Knapp-Monarch Co. features a fireproof asbestos envelope, which is encased in a removable zipper cover that is moisture repellent and washable.

* * * * * * * * * * *

According to a Department of Labor bulletin, productive capacity for all types of building materials, except plumbing fixtures and lumber, is sufficient for a construction rate of $15,000,000,000 annually. For concrete blocks, the Wyatt program calls for 374,000,000 units with excess plant capacity of 126,000,000 units, however, this does not take into consideration other urgent uses for block. Gypsum board and lath required to meet the Wyatt program is 1,766,000,000 sq. ft., and excess capacity is 1,010,000,000 sq. ft. Part of this excess capacity is based on anticipated new plant construction in the East and Far West.

* * * * * * * * * * *

A diatomaceous earth filter has been developed for the U. S. Army to furnish clarified water for the troops. The chief advantages over the old type sand filters are compactness and light weight of the equipment.

* * * * * * * * * * *

A billion-dollar increase in non-residential construction during 1946-47, even with the limitation order curtailing non-essential and deferrable projects, is scheduled under the Veterans Emergency Housing Program, according to National Housing Expediter Wilson W. Wyatt. While night clubs, race tracks, and motion picture theaters will be screened out by the order, he said, materials and manpower will be made available to essential projects such as schools, hospitals, highways, streets, sewers, and other utilities needed in support of the housing program as well as industrial plants producing needed materials or providing needed employment.

* * * * * * * * * * *

A call for bids for the construction of the first section of West Canal, which will serve about a quarter-million acres of farmland in the Columbia Basin irrigation development in Washington, has been announced by the Bureau of Reclamation. The canal, which will extend about 88 miles, will be lined with concrete, and will include two concrete siphons, 25 ft. in diameter, with a combined length of more than a mile.

* * * * * * * * * * *

Mississippi plans to spend $5,000,000 for a county road program, the money to be unmatched by federal funds. The proposed expenditure is in addition to the 4400 miles of farm-to-market roads provided by the legislature earlier in the session to be constructed under supervision of the Mississippi Highway Department.

* * * * * * * * * * *

Experts on nutrition may decide that calcium will have to be added to flour now that we must eat dark bread to help starving Europe, because the phytic acid in 80 or 85 percent flour combines with calcium with the result that bones and teeth are ultimately decalcified. The British added calcium to their war flour.

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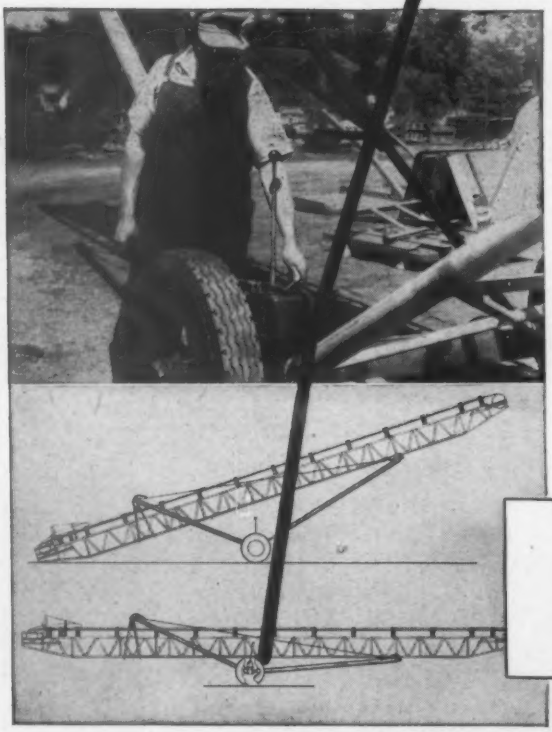
The construction freeze of March 26 apparently has some compensations for the construction industry. The National Housing Agency has authorized funds for harbor improvements at Crescent City, Calif., to provide access to 15 billion board feet of timber for removal from rail lines.

THE EDITORS



Up again down again...

In less than 10 Minutes!



Moving conveyors from one job to the next used to take hours of valuable time, good men and equipment.

Now, it's a matter of minutes. One man can easily elevate a 60′ conveyor in 9 minutes with the new *Pioneer* Hydraulic Conveyor Truck. A twist of a valve, and in 60 seconds the conveyor is back in its cradle . . . ready for another move.

Low overheads are no problem for this smooth rolling truck for it's *built without masts* and requires only 7′3″ clearance.

The *Pioneer* Hydraulic Conveyor Truck handles conveyors up to 60′ in length with belts up to 30″ wide. Write for complete details today.

PIONEER ENGINEERING WORKS, INC.
1515 CENTRAL AVE. • MINNEAPOLIS 13, MINNESOTA

●A sturdy Blackhawk Pump boosts the conveyor into exact feeding position. Once spotted, it's locked securely in place. A low center of gravity, 8′ tread, and pneumatic tires add to portability.

Engineers and Manufacturers of Quarry—Gravel and Mining Machinery

PLAN WITH

Pioneer

ENGINEERING WORKS

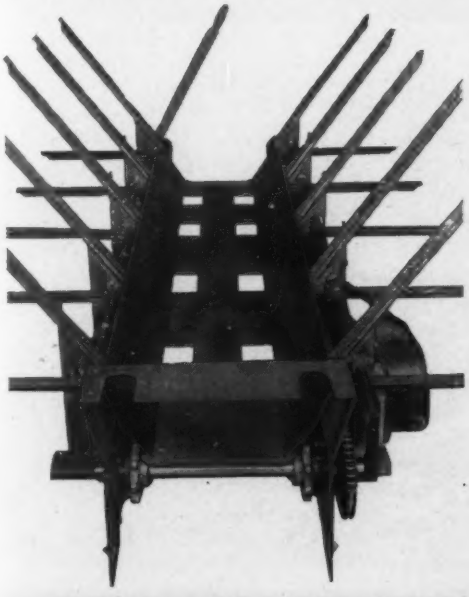
your SPREADING PROBLEMS SOLVED
with "THE NEW LEADER"

Summer or Winter—Wet or Dry there is now a NEW LEADER lime marl and rock spreader to fit your particular problem. With the new electrically welded heavy steel frame plus the wooden hopper you will have a spreader expressly designed to give you many years of hard dependable service. If you are interested in increasing your profits get in touch with us immediately. Don't wait—write or call today!



This is the 11 ft. wide bottom spreader mounted on a long wheel base Ford truck. Standard sizes are 9, 11, 13, and 15 ft. We have found through research that the hopper should be constructed of wood. This eliminates material from freezing to the sides which is so common on the all steel spreaders during cold weather. Thus with THE NEW LEADER you are assured of being able to operate in any weather and still have an even flow and distribution of material.

Here is the electrically welded heavy all-steel frame. Notice the sliding doors open changing THE NEW LEADER into a rock spreader. Within your reach from the cab is a single lever which controls the opening and closing of all the sliding doors in the spreader.





With the extremely wide bottom and the steep sloping sides you are further assured of getting a more even and accurate spread of material. The gear boxes driving the distributor discs are equipped with steel cut gears and ball bearings running in oil in a dust-proof oil-tight gear case. Steel sprockets and heavy duty chains are used.

MANUFACTURERS OF THE WORLD'S MOST COMPLETE LINE OF SPREADERS

HIGHWAY EQUIPMENT CO., INC.

Cedar Rapids, Iowa

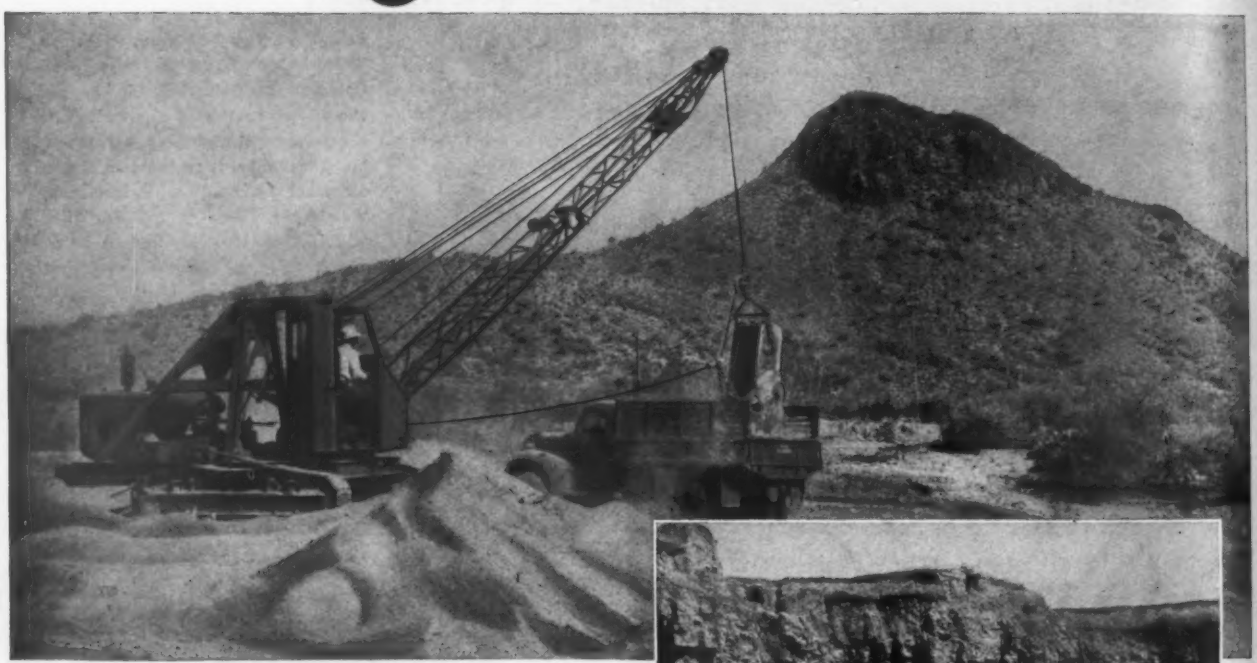
Gross Weight

Dipper Capacity

BY ANY YARDSTICK

First Cost

Operating Cost





. . . the ¾ Swing Badger, with its low center of gravity (for digging power), and lighter swinging weight (for more swings per minute), moves *more material, faster* and *cheaper.*

AUSTIN-WESTERN COMPANY
AURORA, ILLINOIS, U. S. A.

BUILDERS OF ROAD MACHINERY

Austin Western

SINCE 1859

MACHINERY FOR
CEMENT—LIME—ORES

F. L. SMIDTH & CO. Manufacture the Following Complete Line of Modern Machinery for Cement, Lime and Allied Materials, the Sintering of Ores, etc.

UNIDAN multi-compartment grinding mill.
UNIKOM multi-compartment grinding mill.
KOMINUTER for wet and dry grinding.
BALLMILL for granulating.
TUBEMILL for wet and dry pulverizing.
TRIX for grading wet granulated material.
TIRAX MILL for drying and grinding.
ATOX, air swept, vertical shaft pulverizer.
PYRATOR for drying and grinding.
SPRAY CASINGS for pulverizers.
CYLPEBS metallic grinding bodies.
DRAGPEB metal lining for pulverizers.
SILEX flint liners for pulverizers.
AIR SEPARATORS and Cyclones.
AGITATORS for mixing and storing wet mix.
AIR DISTRIBUTORS for slurry tanks.
WASHMILL for disintegrating and mixing materials in water.

ROTARY KILNS for cement, lime, ores, etc.
UNAX KILNS, with integral cooler.
SUCTION GRATE ROTARY KILN.
ROTARY KILNS—Sintering and roasting.
PRE-HEATERS for rotary kilns.
UNAX COOLERS, cooling drums on kiln.
UNAX GRATE COOLER, air quenching.
UNAX PRE-COOLER.
F.L.S. MULTI-TUBE ROTARY COOLER.
F.L.S. INCLINED GRATE COOLER.
COOLERS, Cement, Ores, etc.
CHAIN SYSTEM for wet kilns.
HEAT EXCHANGERS for dry kilns.
KILN CONTROL, electrical.
GAS ANALYZER, electrical.
KILN EQUIPMENT, fans, hoods, dampers, spouts, airseals, dust chambers, multiple gas discharge.

FLUXO PACKER for filling bags.
EXBINER for discharging bulk cement.
EXTRACTORS, cement from silos.
SKIPULTER shaker conveyor.
CYLCUP distributing conveyor.
PNEUMATIC FEEDERS.
SLURRY FEEDERS for kilns and mills.
CRADLE FEEDERS for coal, rock, clinker.
TABLE FEEDERS for coal, rock, clinker.
COAL FEEDERS for rotary kilns.
COAL BURNERS for rotary kilns.
GAS BURNERS for rotary kilns.
OIL BURNING EQUIPMENT for kilns.
SYMETRO Drive, speed reduction units.
PUMPS for heavy liquids as cement slurry.
FLOURMETER for determining micron sizes in finely ground cement, etc.

F. L. SMIDTH & CO., incorporated in the United States in 1895, are engineer specialists in the design and manufacture of calcining and grinding machinery used for cement, lime, ores, etc.

Having a fully equipped laboratory, manned by experienced engineers and chemists, physical and chemical tests can be made on the material to be handled to determine the suitable machine in each individual case.

They are not limited to any particular type, but have machines to suit every condition such as slow speed or high speed, wet or dry, open or closed circuit, air-swept, combined drying and grinding, single stage grinding, multi-compartment mills; and kilns adaptable for calcining, sintering, nodulizing, desulphurizing, oxidizing and reducing roasting; and, in addition, much auxiliary equipment.

While the grinding mills have long been used in many industries, the rotary kiln was formerly used principally in the cement industry, but the specially designed Smidth kilns, due to their high efficiency, are now also playing an important part in the making of magnesium, manganese, aluminum, dolomite, alkali, nickel, lime, iron, tin, etc.

Smidth machinery has been supplied to about 70 different countries of the world, numbering thousands of machines.

The F. L. Smidth & Co. organization maintains a large staff of experienced engineers and can offer extensive engineering services either in connection with the sale of machinery or as separate engineering contracts according to the clients' needs.

F. L. SMIDTH & CO.

11 WEST 42ND STREET ENGINEERS NEW YORK, N. Y.

A MESSAGE TO THE CEMENT INDUSTRY

10 BIG ADVANTAGES OFFERED INDUSTRY IN THE "UNION PACIFIC WEST"

1. AVAILABILITY OF RAW MATERIALS
2. ADEQUATE SOURCES OF POWER
3. OPPORTUNITY FOR DECENTRALIZATION
4. NON-RESTRICTIVE LEGISLATION
5. LARGELY NATIVE-BORN LABOR AVAILABLE
6. HEALTHY LIVING CONDITIONS
7. GOOD SCHOOLS
8. GROWING CONSUMER MARKETS
9. INCREASING INDUSTRIAL DEVELOPMENT
10. FAVORABLE DISTRIBUTION FACILITIES*

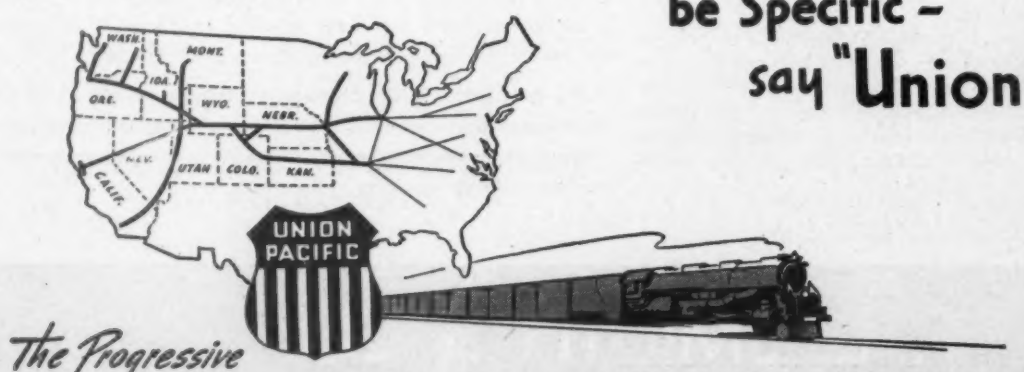
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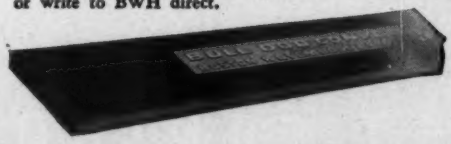
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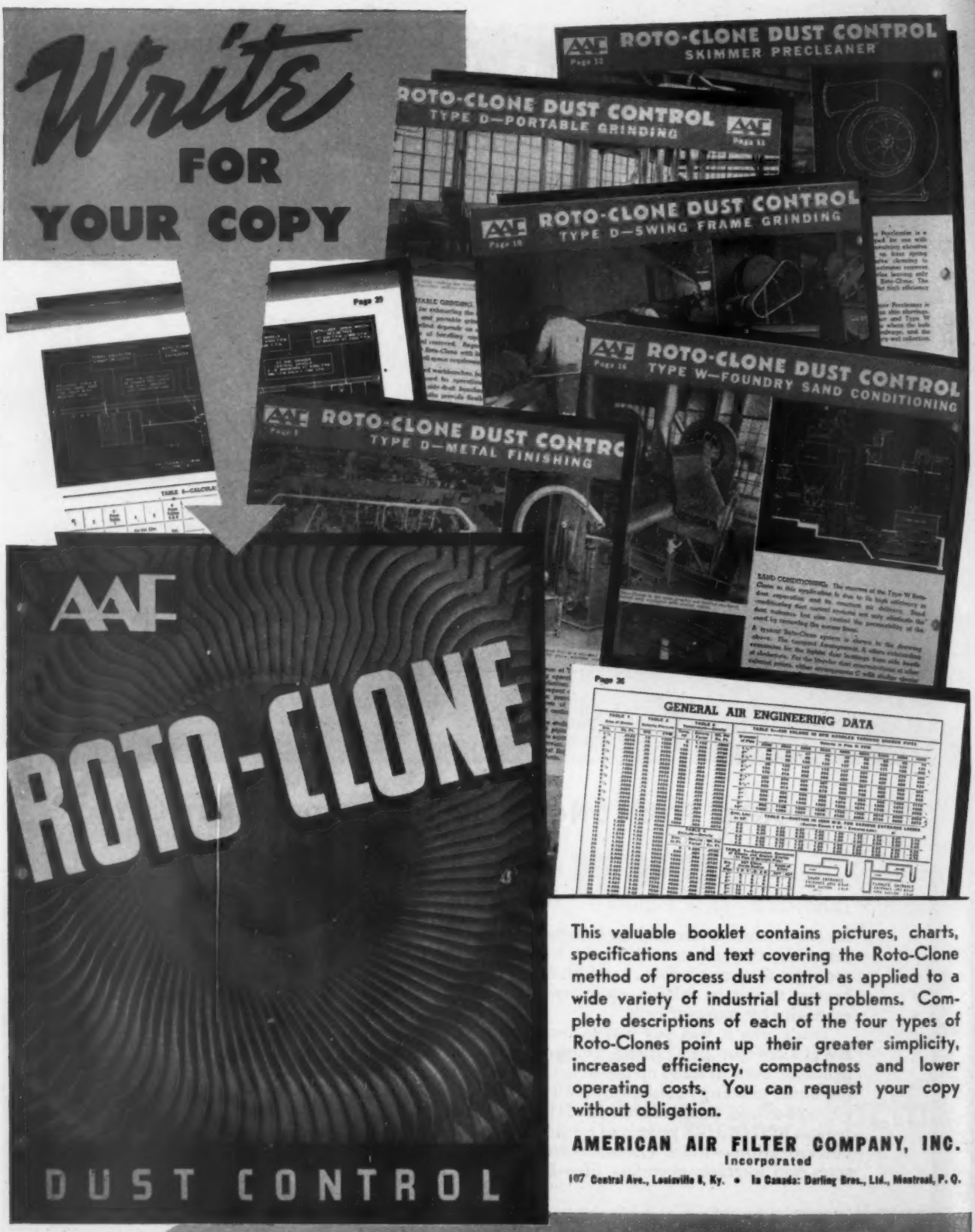
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is a Helicoid (screw) elevator which handles many products that normally can be conveyed by a horizontal screw conveyor. It consists of a vertical screw driven from either the top or bottom, operating in a solid or split casing. The material is fed to the vertical screw by screw feeder near the foot of the lift and is discharged at the top or head end.

The Perfect Discharge Bucket Elevator

operates at slower speeds and is used where materials will not readily discharge at centrifugal speeds. Malleable iron or steel buckets are mounted between two strands of chain. Material is fed directly into buckets at the foot of the elevator or scooped up in the boot and discharged over a snubbed head wheel which inverts the position of the buckets over the discharge chute.

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is used where higher capacity at slower speed is desired or where the material is friable. It consists usually of steel buckets mounted on either a chain or belt. Material is fed directly into the buckets at the foot of the elevator and discharged over a head wheel onto the preceding buckets, whose front and projecting sides form a chute, thereby directing the material into a fixed discharge spout.

The Centrifugal Discharge Bucket Elevator

is used for most products. It consists of either malleable iron or steel buckets mounted on either a chain or belt. The material is fed either directly into the buckets at the foot of the elevator or scooped up in the boot and is discharged over the head wheel by centrifugal action.

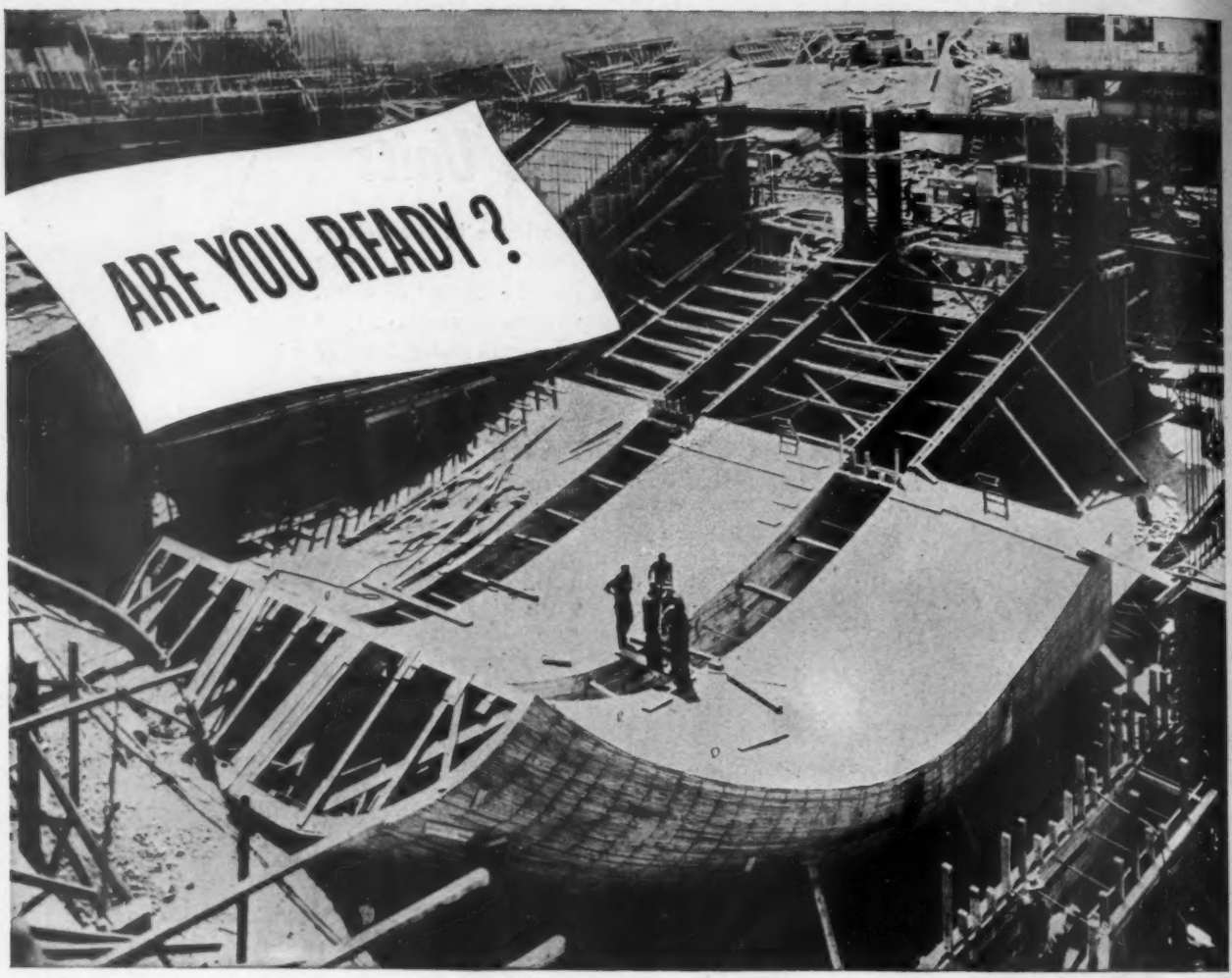


The Bulk-Flo

is used where mass conveying is possible. It consists of malleable iron or steel flights attached to a chain. The material is fed directly into the lower horizontal portion of the casing, thereby eliminating a feeder and is discharged at the opening in the upper portion of the casing, just before the flights reach the head wheel.

10,236

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★ ★ ★ Editor's Page

INDUSTRY PROBLEMS AT A GLANCE

MUCH BENEFIT may be derived from an issue such as this ROCK PRODUCTS' golden anniversary number, for it affords an opportunity to re-examine past events in the industries we serve, that have bearing or possibility of re-application in future industry progress. It is our objective to touch upon significant developments, and historical events, which are the foundations upon which the rock products and concrete products industries were built.

Our personal connection with these industries, as associate editor and later editor of ROCK PRODUCTS, is on the shy side of twelve years so, rather than comment upon events long before my time, which Nathan C. Rockwood has so ably done throughout this issue, impressions from more recent observation seem in order.

Upon graduation from Northwestern University in 1930 with a degree in civil engineering, having written a thesis on concrete design, and bolstered with a few years' work experience, I believed, as all university graduates do, that I knew something about concrete. That may be a matter of some doubt but it soon became evident I knew little of the materials that comprise concrete. University curricula are woefully shy or lacking in treatment of that subject. Cement was just cement and aggregates were sand or gravel or stone.

Must Attract Young Men

Having spent a major part of the last twelve years out in the plants of the industry in our travels from coast to coast, and, noting the obvious trend toward increasingly more scientific preparation and production of aggregates and other products of the industry, it is our impression that these industries are too much taken for granted. Portland cement, of course, enjoys the status of a manufactured product and always has had the benefit of employed technical brains.

By and large, the rock products industries have not been getting fair recognition and therefore it is small wonder that the industry as a whole has been unsuccessful in attracting good young men to become tomorrow's leaders. The majority of the thinking men are those who grew up in the industry, many the hard way, and they have twenty to fifty years' service behind them. Maybe the time is right for a program of industrial relations, or whatever it be called, for the purpose of disseminating information. The sand and gravel plant down at the end of the street isn't just a "pit," as the man on the street identifies it, but is part of an ever-changing industry beset with operating problems to challenge the imagination of good technical men. A program of enlightenment would have other obvious values in human relations.

Research by individual companies, in new product development, for improvement of product and directed toward operational efficiency is an activity that is slighted in the rush of conducting normal business. We see evidence all the time that too little is known of what exists in deposits—the raw materials source—to evaluate their commercial potentialities. It has been only recently that any considerable attempt has been directed toward selective quarrying and excavation, and that is usually done defensively because some physical or chemical shortcoming has threatened an outlet.

Research

Sand doesn't seem a material to stretch the imagination of one searching for new markets; yet a recent incident serves to illustrate how little is known of hidden properties. A producer in the middle-west was shipping normal concrete sand some 200 miles by rail to a large nursery grower located in a heavy sand and gravel producing area. Obviously, the purpose was not for lightening a heavy soil, but the shipper did *not know* the application. There likely was potash or some other valuable soil minerals in his sand, that the purchaser required. Another example is the Ohio gravel concern that built a profitable business in agricultural liming material from gravel after it was discovered that the gravel was high in calcium carbonate.

In our comparatively brief association with the rock products industry, we have seen the "sideline" agricultural limestone business grow into a tremendous industry. Carbonates are the foundation of this industry but who knows the potentialities of other minerals in those limestones or, for that matter, in other classes of stone, for supplying soils with the variety of minerals which the human race must have?

And we might ask, what is being done to develop a supply of lightweight aggregate to satisfy the existing shortage? Maybe some of our trap rocks or other rocks have peculiar properties that will enable them to be expandable into cellular aggregates. Some classes of obsidian are showing great promise.

In the field of production, there exists a challenge to research. The sand and gravel industry has a stickler, yet unsolved, in the production of concrete sand with a high percentage of minus 50-mesh fines and a definite minus 100-mesh fraction.

It might be that the new air-entraining cements, which authorities predict will be tomorrow's standard portland, will be proved to obviate the necessity for increased fines. The crushed stone industry's concern in producing "cubed" particles and in the elimination of soft particles still exists, although marked progress has been made. All the rock products industries have operating problems to be solved by research—so many that we could not even touch upon them on this page.

Bror Nordberg

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Rocky's NOTES

Nathan C. Rockwood

Introduction to TIDBITS OF PROGRESS

BEING THE OLDEST member of the staff, and quite naturally accepted by its other members as an "old timer," the assignment of writing a bit of history, on this our fiftieth anniversary as a publication, seems naturally enough to come my way. Although my associates did not know it, I am something of an antiquarian by birth and inheritance; both my maternal grandfather and his father before him, having been active members of the American Antiquarian Society. History, particularly engineering and industrial history, has been my hobby.

However, in this instance, neither time nor space nor circumstances permits much of a history of the industries served by ROCK PRODUCTS for a half century. The temptation is great to write as much of a detailed historical record as possible, but to our mind this is not what the present reader wants. Moreover, there are various ways of writing history, and modern writers no longer are satisfied to produce a mere chronological record of men and events. Even public school histories in these days attempt to use the historical record largely to establish some particular economic or social theme or theory. So, I have not attempted a history of the rock products industries. The history of ROCK PRODUCTS and its predecessor, CEMENT AND ENGINEERING NEWS, is reviewed in two short articles which follow elsewhere in this issue.

Industry Review—Trends

For such historical record of the industry as is feasible here, the reader will have to depend on the results of a rather hurried thumbing over of many thousands of pages of the bound volumes of the two journals and such scraps of historical lore as appealed to the reviewer as interesting or significant, or sometimes both. In doing so the editor merely follows his natural professional bent, because, in the final analysis, an editor supplies his readers with material that *interests him*. Consequently, the most important part of an industrial editor's education and training, is to get and stay so close to his industry and to the progressive thinkers and planners in it, that he thinks and plans as they do, and then what interests him is bound to interest them. At least that is the formula I have always tried to apply in practice, and one that has paid richly in the dividends of friendship and mutual exchange of confidences.

The chief test of the success of a publication as a leading light in its industry, is the ability of its editors to recognize what are really significant developments *when these occur*, because these developments signify trends. A great deal of printable material that comes over an editor's desk is interesting and helpful to readers as illustrating how things are done. Some are of only contemporary interest; some few point to progressive developments yet to come. The industrial editor who is alive to his opportunities and close to his industry must be able to recognize those developments which mark definite trends. So, we have had this in mind in our hasty review of the files of this publication, with all the advantage of hindsight.

Most busy operators and business men in industry have little use for history—it is water over the dam, to them—yet to one philosophically inclined history proves over and over again that "there is nothing new under the sun." As we have had occasion to note before, it generally takes 25 years or more for a new idea, suggestion or invention to take hold and become universally accepted. The historical record of this industry holds many proofs of this. However, there are apparently reasons for this lag which we have not mentioned before. Nearly all really good ideas, in the way of processing at least, were patented; and paying patented process royalties has never been popular in this and probably most other industries.

From our hasty search through the files of ROCK PRODUCTS, we feel certain that many good suggestions in the past have been passed up for the reason given, or possibly just overlooked, in the march of time, and they should prove worthy of a much more thorough review than can possibly be given here.

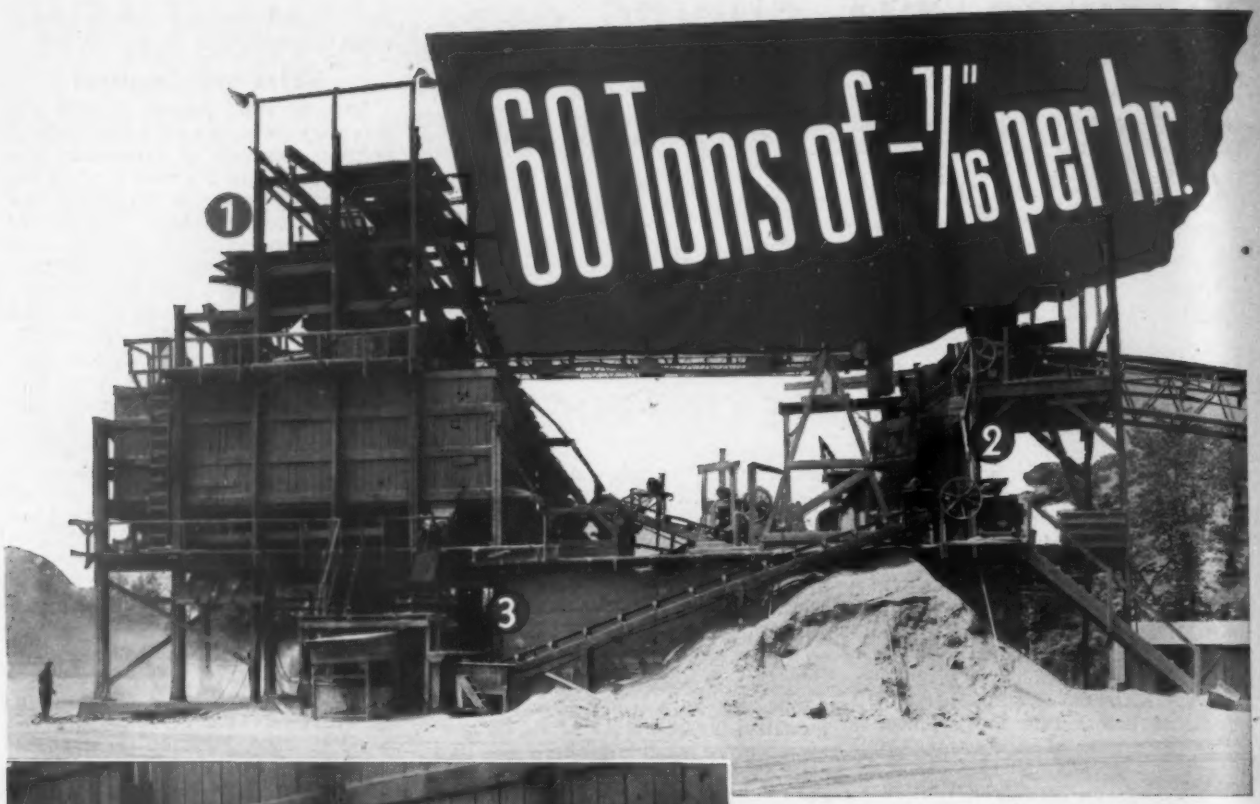
Notes and Comment

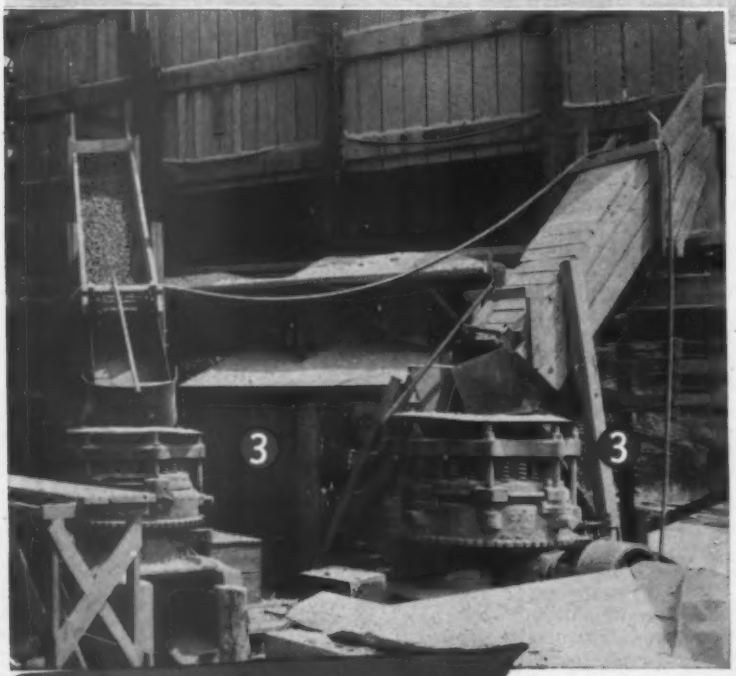
Because what follows in this anniversary issue has no pretentions of being a complete or systematic historical record of the rock product industries we know of no better description for it than "Tidbits of Progress," using the paragraphs and data we have picked out of the past more or less as a basis for accompanying editorial comments inspired by our own recollections and imagination, perhaps, insofar as they portray trends. We trust the result will prove interesting and spur the thoughts and imaginations of others. Some day, now that we are better acquainted with the record, we hope to go back and dig out a great deal of helpful operating data that lies hidden in these files.

The only published "history" we have of any of the branches of this industry is Robert W. Lesley's "History of the Portland Cement Industry in the United States," published in 1924, and Earl J. Hadley's "The Magic Powder," largely a history of the Universal-Atlas Cement Co., published in 1945. Both of these books are rich in the names and records of the men who made the portland cement industry, but neither is very helpful to an operating man or engineer who is seeking specific information as to the source and reason for the significant technical developments.

We have introduced very little of the *biographical* or *personnel* side of the history of these industries in our current review, chiefly because the record is so full of names of individuals who in their lifetimes had great influence in developing the industry, but whose names mean little to present operators unless they have long memories. At some risk that we may be slighting more deserving men, we have mentioned only a few as having left, in our opinion, indelible marks in the progress of the industry—mainly because of their contributions to its technology.

We have also asked a few individuals to contribute bits of their own reminiscences, but not by any means all that we know could write interestingly of the early days. It is hoped, however, that the few personal reminiscences we do publish in this issue will stimulate others to recall interesting steps of progress, and episodes, which we would be glad to publish in coming issues. The old timers would enjoy them, and we'll try to give them the kind of "human interest" slant that will impress the present younger generation with the fact that they are not making all the progress the industry has ever seen. progress the industry has ever seen—and to encourage them with the light of the past, to pick up and carry to fullfilment some of these good ideas of the past.





60 tons of $-7/16''$ per hr. . . . that's outstanding volume for hard, tough trap rock! But this Telsmith-modernized plant is turning it out for the Arlington Stone Co. of Leesburg, Va. Of this 60 tons of $-7/16''$ per hour, over two-thirds is $3/16''$ to $7/16''$ chips.

This extremely flexible Telsmith plant produces every size to meet the very exacting requirements of bituminous surfacing specifications—including 2" ballast rock, $+3/4''-1''$, $+1/2''-3/4''$, $+3/16''-1/2''$ stone, and $-3/16''$ dust. Its 8-hr. capacity is 580 tons of $+1/2''-3/4''$ chips; 480 tons of $+3/16''-1/2''$ chips.

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Modernizing, or building a complete new plant? Send for Bulletin Q-11.

Q-16

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2 Telsmith Gyratory Breaker
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Washington NEWS

FACED with one of the most paralyzing coal strikes in American history, the impact of which reached into every home, the country is now hopefully expecting that with the strike settled some real progress can be made toward reconversion to normal business. Even though labor may win the strike, it may be confronted with legislation which will impose stringent controls. Only the approaching Congressional elections this Fall will act to postpone legislation which will have for its purpose the elimination of threats to health and distribution of food and other essential commodities.

The coal strike undoubtedly will give impetus to conversion of many plants to Diesel power. Thousands of Diesel-electric and gasoline-electric power units were sold during the emergency.

Another result of the strike will be further delays in delivery of essential machinery and a pyramiding of production costs. Embargoes imposed on shipments of sand and gravel, crushed stone, slag, cement and other industrial minerals struck directly at our industry, but were quickly lifted as soon as the emergency was over.

Freight Rate Increase Before the I.C.C.

Hearings started before the I. C. C. on May 15, in Ex Parte 162, with the Class I railroads submitting an application for approval of an increase of 25 percent in freight rates and charges, with certain exceptions as to specific commodities. The increase for sand and gravel, crushed stone, and slag would amount to 20c per net ton. The National Sand and Gravel Association, National Crushed Stone Association, and the National Slag Association have presented a joint brief protesting the increase.

One of the difficulties involves the OPA price freeze of March, 1942, under which producers would be required to absorb an increase in freight rates. Action is now being taken by the associations to bring this matter to the attention of OPA. The National Sand and Gravel Association, for example, has requested MPR-592 be amended to provide a general authority to all sand and gravel producers with delivered price controls to add to their ceiling prices whatever increase in freight rates is authorized by the Commission. Executive Secretary V. P. Ahearn of the National Sand and Gravel Association has suggested that a general amendment is necessary as area and regional orders seem impractical.

No Liability Under Construction Restriction Order

Civilian Production Administration has issued an interpretation of Order VHP-1 that indicates that the aggregates industries are not required to demand of customers proof that materials will be used in accordance with the construction restriction order.

"Paragraph (g) of Order VHP-1 provides that 'No person shall accept an order for, sell, deliver or cause to be delivered materials which he knows or has reason to believe will be used in work prohibited by this order.

"The purpose of this provision is to prohibit the sale or delivery of materials by a supplier if he knows or has reason to believe that the materials supplied will be used in violation of VHP-1. This provision does not impose upon a fabricator or supplier any duty to investigate whether a proposed construction job for which he is asked to supply materials will be begun or carried on in violation of Veterans' Housing Program Order 1, or whether it has been specifically authorized or is exempt under that order. Mere knowledge that the kind of work involved is a kind which ordinarily would require authorization under the order does not constitute reason to believe that the work will be begun or carried on in violation of the order and, in the absence of information to the contrary, the supplier may rely on the builder to get an authorization for the job if authorization is required.

"Paragraph (g) of VHP-1 does not require a supplier to get from a customer a certificate to the effect that the customer is not violating and will not violate VHP-1, or a certificate to the effect that the job for which the materials will be used is exempt under the order or has been authorized under the order."

Sand-Lime Brick Price Increase

Manufacturers of sand-lime building brick have been authorized by the OPA to add $2 to their March, 1942 ceilings. The action, effective April 6, 1946, does not affect manufacturers who already have had individual increases amounting to $2 or more per thousand bricks. Resellers are authorized to pass on the actual dollar-and-cent amount increase resulting from this action.

Fireclay and Silica Refractory Brick Price Increase by OPA

Effective April 1, the OPA raised by 11 per cent the ceiling prices for fireclay and silica refractory brick when produced in the area east of the Mississippi river and in the State of Missouri, in order to cover increases in production costs resulting from government approved wage increases. The price increase affects the manufacturers' f.o.b. plant or delivered prices rounded off to the nearest five cents.

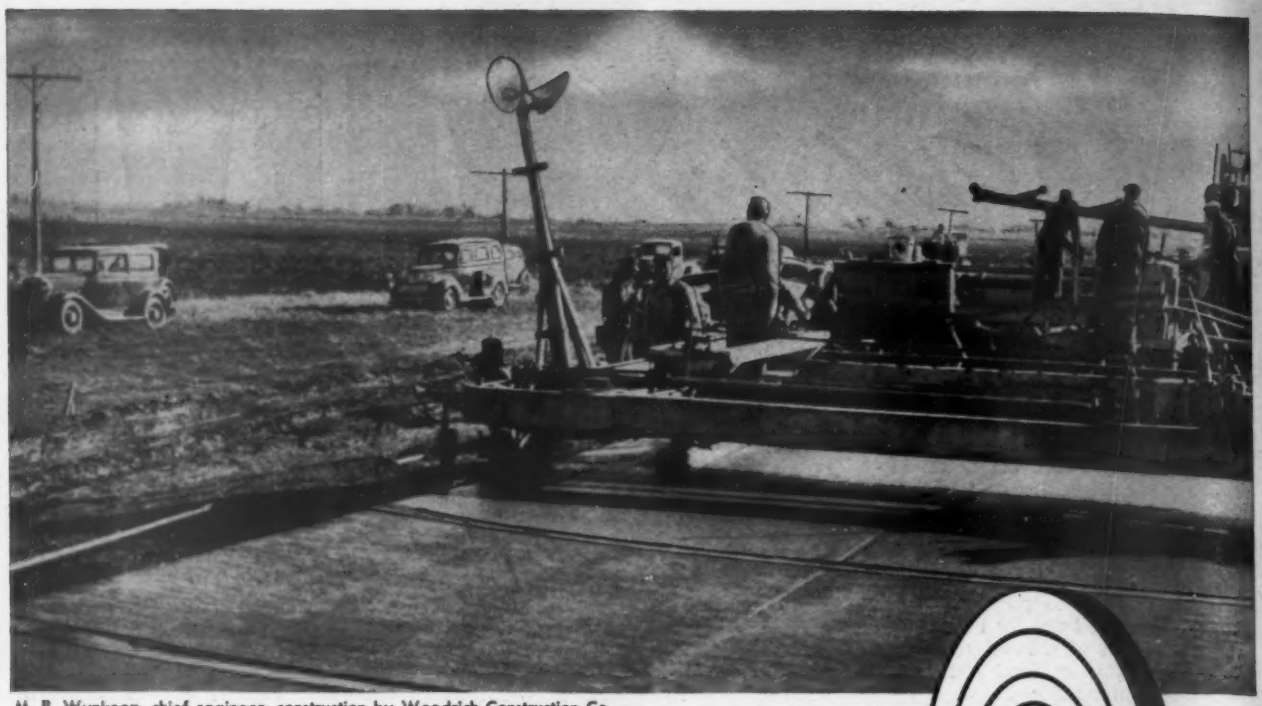
OPA Surveys Products Industry

National Concrete Masonry Association reports that OPA has issued instructions to its regional offices to make a special survey of the industry to determine whether price increases are needed to stimulate the production of concrete products and to grant price relief where needed. Executive Secretary E. W. Dienhart has advised members to file prices on any new products such as ASTM Grade A Hollow Concrete Masonry Units, and Grade A or B (or both) Concrete Brick, or any other new product which is being produced or it is planned to produce.

OPA Chicago regional office has issued Order G-2 under General Order No. 68 establishing a maximum price of 14c for 8x8x16-in. load-bearing concrete block, effective April 19, for all producers in the region. Producers having prices higher than 14c, established as of March, 1942, are permitted to retain the higher price.

Sand and Gravel Convention Arrangements

ROBERT MITCHELL, president of Consolidated Rock Products Co., Los Angeles, Calif., has been appointed chairman of the Committee on Convention Arrangements for the annual convention of the National Sand and Gravel Association and National Ready Mixed Concrete Association during the week of March 3, 1947 at the Biltmore in Los Angeles. For those who seek information regarding Southern California in planning their trips, it is suggested that contact be made with H. G. Feraud, executive secretary, Southern California Rock Products Association, 354 S. Spring street, Los Angeles 13, Calif.



M. P. Wynkoop, chief engineer; construction by Woodrich Construction Co., Minneapolis, operator for S. J. Groves and Sons, Minneapolis, Contractors.

NORTH DAKOTA ENGINEERS...

NICK THE BULL'S-EYE OF AIR-ENTRAINMENT CONTROL!

THE TARGET: Entrained air, as measured by weight reduction of concrete, is specified by the North Dakota Highway Department to be within 3% to 6%. On a paving project west of Wahpeton, the engineers aimed at a concrete weight reduction of 4%.

THE SHOT: Prior to paving operations, weight of concrete without entrained air was determined by batch tests made with regular cement. The resulting weight was the basis for measuring the weight reduction of the air-entrained concrete. A cement interground with the precise amount of air-entraining agent needed for satisfactory field performance was insured by the use of Atlas Duraplastic.

THE HIT: Throughout the job, concrete weight reduction was constantly checked. At the end of the run, the tests revealed an overall average weight reduction of 3.6%... or only 0.4% off the target of weight reduction as a measure of entrained air!

THE DETAILS: An article describing the above job in detail will be sent upon request. Write to Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Chrysler Bldg., New York 17, N. Y.

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the *Personal Side* of the news

Resigns

FLOYD L. MABIE, manager of the Atlas White Bureau of the Universal Atlas Cement Co., New York, N. Y.,



Patrick F. Morrissey

has resigned after 18 years of service with the company to become president of a concrete products manufacturing concern in Greensboro, N. C. PATRICK F. MORRISSEY, former Atlas White representative in the Kansas City area, has been appointed to succeed Mr. Mabie as manager of the Bureau. Mr. Mabie joined the Universal Atlas Cement Co. in 1928 as representative in northern New Jersey and New York. In 1930, he was made assistant manager of the Atlas White Bureau and in 1937 was appointed manager. Mr. Morrissey was employed by the company in 1939 as representative in Kansas City. He joined the U. S. Navy as Ensign in February, 1944, and after two years of active service in the Pacific areas, was honorably discharged as Lieutenant (j.g.). He returned to the company in February, 1946.



Floyd L. Mabie

Return from Service

LEA P. WARNER, JR., industrial relations manager of Warner Co., Philadelphia, Penn., has returned to his former duties after three years' service in the Navy. His work in connection with the safety program was carried on by Richard Stiles during his absence. While in the Navy, Mr. Warner was stationed at the Phila-



Lea P. Warner

delphia Navy Yard, Mare Island, Calif., and Charleston, S. C.

CALVIN C. PURNELL, who also saw service in the Navy, has assumed his old position as personnel manager at Bellefonte, Penn. As a lieutenant in the Navy, Mr. Purnell saw action in the Pacific area.

Consumers Officer

DAYTON SMITH has been elected vice-president of Consumers Co., Chicago, Ill., and will be in charge of the ice division and building material sales.

P.C.A. Appointments

ROBERT W. WINTERS, district engineer in charge of the Kansas office of the Portland Cement Association, has been appointed manager of the West Central offices. He will supervise work handled by the St. Louis, Oklahoma City, Kansas City, Omaha and Denver district offices.

EDWARD J. MUELLER will succeed Mr. Winters as district engineer in Kansas. Both men will make their headquarters in Kansas City, Mo.

JAMES D. PIPER, structural field engineer in the Houston office, has been made district highway engineer with headquarters in Dallas, Texas. He will direct the highway, bridge and paving activities in Texas.

C. A. CLARK, district engineer in Texas, with headquarters at Austin, will continue in charge of work other than in the highway field.

F. E. VOTAW, who has been chief field engineer of the Association in the Boston area since 1941, has been appointed district engineer in charge of activities in New England with his headquarters in Boston, Mass. Mr. Votaw joined the P.C.A. as a field engineer in 1935.

E. W. THORSON, structural engineer in the Minneapolis district, has been named district engineer of the recently opened office in Denver, Colo., which will be headquarters for activities in Colorado and Wyoming, taking over the services previously rendered by the Western Portland Cement Association. Mr. Thorson has been with the P.C.A. since 1934 when he joined the staff as a fieldman in Iowa.

Flying "Katter-Blox"

GEORGE W. KATTERJOHN of Katterjohn Concrete Products Co., Paducah, Ky., has reached the point in his business where he is sending blocks by air. Commenting on the accompanying illustration, Mr. Katterjohn sent us the following explanation: "Recently the Chicago and Southern Airlines began a service in Paducah on its route from New Oreans to Detroit. Paducah furnished so much air express that it was necessary to run



George Katterjohn holding one of six "Katter-Blox" shipped by air

a second ship on that day for air cargo alone.

"For this initial flight, we shipped by air express six of the famous cinder 'Katter-Blox.' You will notice that I am holding one block and there are three more blocks shown on the stand. This shipment flew north; one block went to Evansville, two to Indianapolis, and one block to Detroit. On the south-bound flight, we sent a block to Memphis and one to New Orleans." Who would ever think that the time would come when block were so scarce that they would have to be shipped by air.

Represents Cement Firm

ROY A. MURRAY, who formerly represented the Pacific Portland Cement Co., San Francisco, Calif., in the Sacramento, Calif., territory, has been named sales representative for the company in northern Oregon and southwestern Washington under Charles J. Lair, district manager, Portland, Ore. Mr. Murray was at one time associated with J. E. Jellick, sales manager, in the San Francisco Portland Cement Information Bureau.

N.A.P.D. Counsellor

MARK E. SNYDER, labor relations expert and director of the Marblehead Lime Co., Chicago, Ill., has joined the counseling service of the National Association of Personnel Directors.

Wins Safety Award

GLENS FALLS PORTLAND CEMENT CO., Glens Falls, N. Y., employes recently celebrated the winning of the Portland Cement Association Safety Award for 1945. The foremen and assistant foremen are shown on each side of the trophy illustration, below.

President Talc Concern

OSCAR T. SEMELL, who has been connected with the Northwest Talc and Magnesium Co., Clear Lake, Wash., since it was organized, has been elected president of the company, replacing Carl Field, who died recently. EMMA B. KERLEE was elected vice-president and a member of the board of trustees to finish out the term of Carl Field.

Returns from Service

PHILIP M. PARK, after completing two years in the Navy, has returned as vice-president of the Besser Manufacturing Co., Alpena, Mich. Mr. Park served in the Bureau of Ships and in the Office of Public Information in Washington, D. C. He also saw service as Air Combat Intelligence Officer with Air Group Eleven with the Pacific Fleet.

Mining Consultant

H. W. STRALEY, III, chief of the Forest and Mineral Products Section of Supply and Resources Service, Foreign Economic Administration, Washington, D. C., has retired from government service. He has opened consulting offices in Washington, where he will specialize in exploration of mining and oil properties in the Appalachian, Atlantic Coastal, and Caribbean region. Mr. Straley is chairman of the Geophysics Education Committee, Mineral Industry Education Division, A.I.M.M.E.

Veterans' Housing Deputy

REAR ADMIRAL KIRBY SMITH, U.S. N.R. (Civil Engineering Corps), has been appointed general deputy expediter for the Veterans' Emergency Housing Program by Wilson W. Wyatt, National Housing Expediter and Administrator of the National Housing Agency. He was formerly director of the Construction Division of the Bureau of Yards and Docks. Admiral Smith, one of the Navy's top-ranking construction men during both World War I and II, will be general deputy for Mr. Wyatt in charge of all operations of the program. He is well known throughout construction circles—civil as well as military—both in this country and abroad. Admiral Smith resigned from the Navy in 1920, and for the next 20 years was affiliated with the Newport Shipbuilding Company and with the Raymond Concrete Pile Co. At the outbreak of World War II, he returned to the Navy as a commander in the Civil Engineering Corps, again serving in the Bureau of Yards and Docks.

Heads Port Commission

HANS MUMM, JR., president and manager of Everett Concrete Products Co., Everett, Wash., has been elected president of the Everett Port Commission. In 1920 Mr. Mumm was field engineer for the Portland Cement Association, Spokane, Wash., and later went to Portland, Ore., as district manager. He established the products company in 1926.

Construction Engineer

COL. RUSSELL S. LIEURANCE, who was recently discharged after serving overseas with the 1163rd Engineers Group, has been appointed acting construction engineer for the Boysen and Owl Creek units of the Missouri Basin project, Bureau of Reclamation, with offices in Thermopolis, Wyo. Prior to entering the Army, Col. Lieurance was construction engineer at the Altus, Okla., project.



Front row, left to right: Charles Garrett, assistant foreman, carpenter shop; Robert LaBarge, foreman, electrical department; John Hogan, assistant foreman, packing department; Wilfred Leroux, general shift foreman; James Donovan, foreman, raw mill; Kenneth Davignon, foreman, kiln department; Arthur Elms, general shift foreman; James Cunningham, foreman, machine shop; Joseph Gagliardi, foreman, yards; Ovela Lemery, assistant foreman, repair crew; Joseph Vitouski, assistant foreman, finishing mill. Back row, left to right: Clifford Penders, assistant foreman, machine shop; Fred Neroni, assistant foreman, quarry; Adolphus St. Louis, assistant foreman, repair crew; William McCune, storekeeper; Albert Delair, assistant foreman, electrical department; Cornelius Nealon, foreman, coal mill; Homer Jarvis, foreman, finishing mill; Uiric Legault, foreman, repair crew; Andrew Nelson, foreman, carpenter shop; Herman Oudekerk, foreman, packing department

Mrs. Secretary!

AFTER SEVEN YEARS of good, efficient and faithful work for the National Lime Association, Mrs. Roma Medford Turpen has been appointed secretary and assistant treasurer, effective July 1. She has been married to an ex-Navy man since January 1, 1943, but some of her many friends and admirers in the lime industry still think of her as Roma Medford. She is a native of Washington, D. C., where she was born December 9, 1907—one lady who does not refuse to name her birthday! Mrs. Turpen has an LL. B. degree from Washington College of Law, and if our memory serves us correctly she was at one time interested in ballet dancing as a hobby or diversion. Mrs. Turpen was made assistant secretary of the association in 1934 and has been the editor of its Safety Bulletin and looked after the association's annual safety contest for several years.



Roma M. Turpen

Elected Vice-President

SVEN G. THYRRE, vice-president of F. L. Smidth & Co., New York, N. Y., has been elected executive vice-president of the National Portland Cement Co., Philadelphia, Penn., with plant at Brodhead, Penn. In addition to his new duties, Mr. Thyrre will continue in his position as vice-president of F. L. Smidth & Co.

Director of Engineering

R. E. COPELAND, who for the past several years has been in charge of concrete products research in the development department of the Portland Cement Association, Chicago, Ill., has been appointed director of engineering for the National Concrete Masonry Association. Mr. Copeland is an outstanding authority on the technical problems of the manufacture and use of concrete masonry units, having been associated with the Portland Cement Association for the past 17 years. He started his service in the Cement Products Bureau and for the past few years has been in charge of concrete products research.

Gold Medal Winner

IT SEEMS that a prominent man's background is not always given appropriate publicity until he receives an honor justly deserved. The American Society of Agricultural Engineers has just awarded the Cyrus Hall McCormick Gold Medal for 1946 to WILLIAM G. KAISER, manager of the Farm Bureau of the Portland Cement Association, Chicago, Ill.

Mr. Kaiser was born June 10, 1887, on a farm in Stephenson County, Ill.



William G. Kaiser

Following his graduation from Iowa State college, Mr. Kaiser was made assistant chief of the agricultural engineering section of the Iowa Agricultural Experiment Station, where he had charge of research in farm structures. In 1917 he joined the staff of the Portland Cement Association in charge of educational and promotion work for the use of concrete on the farm. The same year he became a member of the A. S. A. E. In 1935 Mr. Kaiser became a member of the American Concrete Institute, has served on several committees, including the standards committee, and was chairman of the department of shop manufacture. He was the first chairman of the Farm Structures Division of the American Society of Agricultural Engineers, holding the post for two years. He was president of the Society from 1929-30. He has also served as vice-president, councilor, and member of the Nominating Committee. At present he is serving on the A. S. A. E. Advisory Committee to the U. S. D. A. Agricultural Research Administration.

OBITUARIES

JOHN LAWSON SENIOR, SR., chairman of the board of directors of the Consolidated Cement Corp., Chicago, Ill., passed away in New York, N. Y., on April 29. He was 67 years old. His home during recent years has been at Lenox, Mass. Born in Montgomery, N. Y., Mr. Senior attended University Preparatory School at Ithaca, N. Y., and graduated from Cornell University Law School in 1901. While at Cornell he founded the Cornell Alumni News and on his graduation became Cornell's first graduate manager of athletics. He was a trustee of Cornell from 1918-1928.

At the time of his death Mr. Senior was also president and a director of the Cowham Engineering Co., Chicago, Ill.; Signal Mountain Portland Cement Co., Chattanooga, Tenn.; Florida Portland Cement Co., Tampa, Fla., and the Trinity Portland Cement Co., Dallas, Fort Worth and Houston, Texas. He became president of Consolidated Cement Corp. in 1926 when the Peninsular Portland Cement Co. was merged with the Great Western Portland Cement Co. of Mildred, Kans. and the Fredonia Portland Cement Co., of Fredonia, Kans. to form the Consolidated Cement Corporation.



John Lawson Senior, Jr.

IT S-T-R-E-T-C-H-E-S

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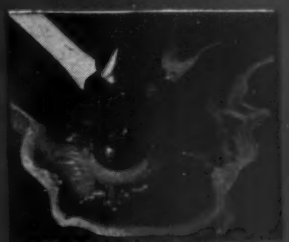
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THIS unique "stretch test" is convincing proof that *Texaco Marfak* has amazing ability to *hold together*. That means it stays where you put it. It won't squeeze out under heavy loads, won't jar out under the hammering of rough service. It also seals out dirt and moisture, protects parts longer.

Contractors everywhere find that *Marfak* gives greater protection with fewer applications. *Marfak*-protected machinery stays on the job longer. Fewer repairs and parts replacements are necessary. Maintenance costs are reduced.

To prolong the life of wheel bearings, use *Texaco Marfak Heavy Duty*. It forms a protective film inside the bearing, while retaining its original consistency at the outer edges — thus sealing itself in, sealing out dirt and moisture. It gives longer-lasting protection. Requires no seasonal repacking.

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news OF THE INDUSTRY

Reopen Gypsum Plant

NATIONAL GYPSUM CO., Buffalo, N. Y., has resumed operations at its Portsmouth, N. H., gypsum board plant and plaster mill after a three-year shut-down during which the plant was leased to the U. S. Navy to house naval supplies and for fabricating purposes. Since November, 1945, the plant and dock facilities have been repaired and renovated. Frank Crowley will resume direction of the plant. Ray Davis is board plant superintendent. Two ships purchased from the Canadian government, the Hampstead Park and Montebello Park, will transport rock from Nova Scotia gypsum quarries of the company to the Atlantic seaboard plants.

Organize Ready Mix Concern

CARTHAGE READY MIX CO., Carthage, Mo., has been organized by Walter Largent, formerly with the Medusa Portland Cement Co., at Kansas City, Mo. Operations are now under way, according to reports. Aggregate bins will have a capacity for 150 tons of sand and stone. Two Smith transit mixers of 2½-cu. yd. capacity each mounted on White trucks will be used, and the plant will have Heltzel batching equipment.

New Name

BRYAN ROCK AND SAND CO., INC., Raleigh, N. C., is the new name of the Bryan - Monroe Co., producers of sand, gravel and crushed stone. James E. Bryan is president of the company; D. T. Bailey is vice-president; L. B. Hughes, secretary and treasurer; and J. D. Lane, general superintendent and operating manager. The sand and gravel plants are located in Garysburg and Bunnlevel, N. C., the sand plants at Goldsboro and Aberdeen, N. C., and the quarries at Rolesville, Wendell and Bailey, N. C.

Resume Block Production After OPA Price Relief

M. J. GROVE LIME CO., Frederick, Md., has resumed concrete block production since OPA granted adequate price relief. President Robert B. Crothers reported that resumption of operations on a full-time basis is expected to release to consumers about 20,000 units a week. An increase, ranging from 1½c on small block to 2¾c a unit on large block is being permitted. On April 12, the company announced that it was closing down as OPA had failed to grant adequate price relief. At that time the company officials pointed out that blocks had been sold for over two years at a loss, and the company would continue to lose money on every block sold under a ½c price increase authorized by the OPA. The company has a potential production of 750,000 to 1,000,000 units per year.

Cement Base Point Pricing Case Trial

LEGAL COUNSEL for the cement industry has been busy in Chicago, Ill., since April 30 defending the Cement Institute and various cement companies as co-defendants in the Federal Trade Commission suit to broaden the legal prohibitions against the use of the multiple basing point delivered price system, requesting a cease and desist order from the United States Circuit Court of Appeals.

The government attorneys are citing the Corn Products Refining Co., and Staley cases decided by the Supreme Court a year ago and the maltsters and milk can decision of the United States Court of Appeals at Chicago this winter. The original complaints against the Cement Institute and 89 company defendants were filed by the Federal Trade Commission nine years ago, and a great mass of testimony has been accumulated over this period. It is anticipated that a decision will be handed down by the Appeals Court this summer, but in any event it is expected that the case will be carried to the Supreme Court.

Start Ready Mix Plant

MCNAMEE READY MIX CONCRETE CO., Xenia, Ohio, has been organized by John R. and Chas. F. McNamee. A 2.62 acre tract has been purchased on which will be erected four buildings, including a bulk cement plant, sand and gravel bins, and a garage for trucks. It is planned to start operation about June 1. Equipment will include four mixer trucks and a crane. John R. McNamee has been in the coal business for a number of years as head of McNamee Fuel and Supply Co., 328 S. Detroit street.

Win Liability Suit

SPOKANE PORTLAND CEMENT CO., Spokane, Wash., and Washington Water Power Co., were defendants in an $8000 damage suit brought by parents of a boy who was killed when he came in contact with a high voltage wire on the roof of the plant while hunting pigeons. Frank Neill, plant superintendent of the cement company, testified that it would require two miles of fences and four or five gates for railroad crossings if the plant at Irvan, Wash., was completely fenced in. The court held for the defendants that the boy was a trespasser and the companies were not liable.

Make Roofing Material

WEATHERMASTER MANUFACTURING CO., Tonganoxie, Kans., recently placed two rock wool cupolas in operation after they had been lined with new refractory brick. W. C. Thomas, manager, reported that 20 bbl. of roofing material made of rock wool and asphalt would be produced daily. Haigwood Crushed Stone Co., west of this city, furnishes the crushed rock for the plant.

Lease Gravel Lands

CENTRAL SAND & GRAVEL CO., and Matthewson Sand Co., have leased sand and gravel deposits from the Kennewick, Wash., Chamber of Commerce. Both companies formerly operated in Pasco, Wash., but had to move as the City Council passed an ordinance banning gravel pits in the city limits. The Central Sand and Gravel Co. also plans to produce ready mixed concrete.

To Make Stucco

H. L. WAGNER, formerly associated with the Mission Lime Products Corporation, Los Angeles, Calif., recently started production of exterior and interior stucco at a plant in Hynds, Calif. The company will be known as the Mission Stucco Co. Mr. Wagner purchased the manufacturing formula from the Mission Lime Products Corporation which will concentrate upon the manufacture of Kalite Acoustic plaster.

Modernize Quarry

THE GEORGIA MARBLE CO., Tate, Ga., recently placed a G.E. Diesel-electric locomotive in operation on its 12-mile quarry railroad. Other equipment installed includes three Browning steam locomotive cranes, an American Hoist & Derrick Diesel locomotive crane, a Ty-Sa-Man three-speed electric quarry hoist, and three Ingersoll-Rand compressors, totaling 1000 hp. This company produces crushed limestone and crushed marble as well as dimension stone.

Make Block and Ready Mix

NORTHWEST MATERIALS CO., Bryan, Ohio, is erecting a new plant to manufacture concrete block and produce ready mixed concrete. Glenn J. Pierman, Columbus, Ohio, is president of the company which has been an active sand and gravel producer since 1941.

Sand and Gravel Concern Enters Block Business

ARKHOLA SAND AND GRAVEL CO., Fort Smith, Ark., has started construction of a new $100,000 plant for the manufacture of concrete products and another unit to produce bituminous mixes.

Production in the block plant will be 5000 standard concrete units daily. Seven large curing rooms also will be built. Operations are expected to start about May 1, when the first cured products will be available.

The asphalt plant will have a capacity of 60 tons of bituminous mix per hour. Operations at this unit are now under way.

This company also produces ready mixed concrete, and is extending operations by the addition of three new 4½-cu. yd. mixer trucks.

Triple Agstone Production

FORT DODGE LIMESTONE CO., Fort Dodge, Iowa, has tripled agstone production with the installation of a New Holland Model 3030 double-impeller crusher. The new crusher replaced a No. 7½ gyratory and a small rotary crusher. This plant has a mining operation, and four trucks have been added to replace the old mine cars formerly used. Trucks are loaded with a recently purchased Bucyrus-Erie dozer shovel.

Build Gravel Plant

L. COLUCCIO CO., Seattle, Wash., contracting concern, has purchased 80 acres just north of Centralia as the site for a new sand and gravel plant. It will produce material for its own use and will also sell to other contractors. Plans also are under consideration to install a blacktop plant if contracts are secured for that type of highway surfacing. The plant is to be in operation early in May.

Organize Block Concern

CONCRETE PRODUCTS, INC., Greenfield, Ohio, a company recently organized with a capital of $75,000, is now producing concrete block, and concrete joists will be made as soon as equipment has been obtained. R. W. Fennig is president and general manager; S. W. Fennig is vice-president; and N. B. Fennig is secretary-treasurer.

Ready Mix and Asphalt

READY MIXED CONCRETE AND ASPHALT CO., Meridian, Miss., has recently started operations with a fleet of five Jaeger 2- and 3-cu. yd. transit mixer trucks. A two-compartment, 70-cu. yd. Butler Bin equipped with weigh batcher serves the mixers. When the plant is completed, central mix will be featured. An asphalt plant also will be built. Jack L. Harris and Charles M. Bailey are partners in this company. Mr. Harris is also associated with the Concrete Gravel Co., and the Gatesville Gravel Co., of Jackson, Miss.

Warner Additions

THE WARNER CO., Philadelphia, Penn., has installed a 5½-ft. Symons cone crusher and a 4- x 14-ft. Allis-Chalmers vibrating screen at the Van Sciver plant. The new crusher replaces a gyratory crusher which was installed when the plant was built. Commenting on this change, Chief Engineer E. L. Shoemaker said that the new unit will crush a greater amount of stone and to a smaller size than the gyratory crusher, and can be quickly adjusted to produce varying sizes of stone, a feature which is desirable due to the increase in gradings the company is called upon to furnish.

The new screen was installed to separate the product of the new crusher and channel it direct to storage bins. A unique distributing box at the discharge end of the screen permits the sized stone to be directed to the crushed stone elevator, to the disc crushers or to the crushed material plant, either in whole or fractionally.

To house this new crusher, a new wing was added to the present building. A new 30-in. belt conveyor also was installed to transfer crushed stone from the crusher to the screen.

COMING CONVENTIONS

American Institute of Mining and Metallurgical Engineers, 75th Anniversary Meeting, Waldorf-Astoria Hotel, New York, N. Y., September 6-18, 1946.

American Institute for Testing Materials, Annual Meeting, Buffalo, N. Y., June 24-28, 1946.

National Crushed Stone Association, Directors' Meeting, Hotel New Yorker, New York, N. Y., July 18, 1946; Agricultural Limestone Division, July 19, 1946.

National Crushed Stone Association, Annual Convention, Edgewater Beach Hotel, Chicago, Ill., January 27-29, 1947; Agricultural Limestone Division, January 30-31, 1947.

National Safety Congress and Exposition, Stevens Hotel, Chicago, Ill., October 7, 1946.

National Ready Mixed Concrete Association, Annual Meeting, Biltmore Hotel, Los Angeles, Calif., week of March 3, 1947.

National Sand and Gravel Association, Annual Convention, Biltmore Hotel, Los Angeles, Calif., week of March 3, 1947.

Cement Production

BUREAU OF MINES reports that production of finished cement during February, 1946, totaled 9,250,000 bbl. or 72 percent greater than that reported for February, 1945. This remarkable gain reflects the increasing demands for cement as the construction industries revive. Shipments of 7,853,000 bbl. were also 72 percent above those reported for the corresponding month of the previous year. Mill stocks on February 28, although 10 percent lower than at the end of February, 1945, were considerably larger than at the end of January, 1946.

The following statement gives the relation of production to capacity, and is compared with the estimated capacity at the close of February, 1946, and of February, 1945.

RATIO (PERCENT) OF PRODUCTION TO CAPACITY

	Feb. 1946	Feb. 1945	Jan. 1946	Dec. 1945	Nov. 1945
The month	50.0	29.0	47.0	48.0	54.0
12 months	46.0	37.0	44.0	43.0	42.0

New York Cement by Barge

GLENS FALLS PORTLAND CEMENT CO., Glens Falls, N. Y., is shipping 20,000 bbl. of cement to New York City by barge to customers desiring waterfront delivery. The barges are loaded at Fort Edward terminal, the cement being trucked to that point from the cement plant, and thence by the Champlain Barge Canal to Albany.

Pavement Yardage

AWARDS OF concrete pavement for April and the first four months of 1946 have been announced by the Portland Cement Association as follows:

Square Yards Awarded	April, 1946	First 4 Mos., 1946
Roads	2,509,875	7,142,096
Streets and Alleys	977,522	2,390,308
Airports	415,970	737,276
Total	3,903,367	10,269,680

Open Branch Pipe Plant

North Dakota Concrete Products Co., Bismarck, N. Dak., is building a concrete pipe plant on a five-acre site which, according to President Rolf Normann, will be one of the most modern in the northwest. Pipe from 6-in. to 84-in. diameter will be made. The company, with other plants at Schmidt, Minot and Williston, is identified with The Cretex Companies, Inc., Elk River, Minn., which has plants in Montana, South Dakota, Minnesota, Wyoming and Iowa. Richard Ludtke will be in charge of the Bismarck plant.

Cooperative Ready Mix

Dubuque Stone Products Co. and Molo Sand and Gravel Co., Dubuque, Iowa, are collaborating in the construction of a new ready mixed concrete plant, expected to be in operation by August, 1946. Equipment will include two cement and three material bins, six 2- and 3-cu. yd. Jaeger transit mixers, a central mixer, and two 2-cu. yd. Dumpcrete trucks. Capacity will be about 1000-cu. yd. per day.

Protest Agstone Rates

National Agricultural Limestone Association, Inc., New York, N. Y., has entered a formal protest before the I.C.C. in Ex Parte No. 148, against lifting the suspension to increases in freight rates and charges on crushed, ground and pulverized agricultural limestone, limestone dust and other forms of limestone embraced in Commodity Group 351 established by the Commission November 22, 1927.

Start Screening Operations

Arlington Sand & Gravel Co., Arlington, Wash., has started screening operations at its screening plant on the river bar west of the city. The company also has a batching plant and ready mixed concrete truck.

Open Ready Mix Unit

Port Clinton Lumber and Coal Co., Port Clinton, Ohio, has started operating its new ready mixed concrete plant which has a capacity of 200 cu. yd. per day. The plant has been made as completely automatic as possible with electrical controls.

New Owners

Van Der Vaart Brick and Building Supply Co., Sheboygan, Wis., has been purchased by John Heronymus from Mrs. John Van Der Vaart and Mrs. Louis Gartman. In 1944 the company acquired the Wiegand Concrete Products Co., Green Bay, Wis.

Sell Block Plant

Anderson Concrete Products Co., Marshalltown, Iowa, has been sold to C. W. Conte, Spencer, Iowa. Plans are being made to expand operations.

Crushed Stone Conventions to Chicago

At a meeting of the Executive Committee, Agricultural Limestone Division, N. C. S. A., on May 10 at the Edgewater Beach Hotel, Chicago, Secretary-Treasurer J. R. Boyd announced that it had been decided to hold the 30th annual convention of the N. C. S. A. in Chicago at the Edgewater Beach Hotel on January 27, 28 and 29, 1947, which would be followed by the second annual convention of the Limestone Division on January 30 and 31 at the same hotel. The mid-year Directors' meeting of the National Crushed Stone Association was scheduled for the New Yorker Hotel, New York City, N. Y., July 18, followed by the meeting of the Limestone Division directors on July 19. The Executive Committee of the Division approved the arrangements.

While the foregoing announcement was not the first order of business brought up by Chairman S. P. Moore, it certainly was a subject which met with most eager attention and agreement.

Henry Huschke presented an interesting report on the Limestone Division's activities, laying particular stress on the promotional and educational material which has been distributed and the plans for future activities. He said that 200,000 copies of the first folder, "Repair and Rebuild with Limestone and Legumes," had been distributed by member companies, government agencies, etc., and had been very well received. Five newspaper advertisements in two sizes, telling the soil liming story, had been prepared by the Agricultural Advertising Co., Ithaca, N. Y. Mention was made of the invisible ink postal card results. Consideration also is being given to the preparation of another card of this kind with a different message. Mr. Huschke referred to work now going forward in the gathering of statistics by States on production and consumption.

Mr. Boyd discussed at some length the blanket freight rate increase proposal of the railroads up for hearing by the Interstate Commerce Commission in the near future. He pointed out that the proposed increase is 20c a ton for crushed limestone, including agricultural limestone, and 30c a ton for fluxing stone and raw dolomite. After considerable discussion by the committee, it was decided that the Agricultural Limestone Division would file a separate brief in Ex Parte 162. The National Crushed Stone Association will continue the practice of filing a joint petition with the National Sand and Gravel Association and the National Slag Association to cover aggregates.

A campaign was outlined to increase membership in the Agricultural Limestone Division, and Mr. Boyd and Mr. Huschke asked for further suggestions from the Committee. Chairman Moore suggested that the list of prospective members be screened for active producers by a member producer in each State to secure an accurate list of producers who would be potential members. This list would be followed up by producer members in various sections within States.

In considering promotional activities presented by Mr. Huschke, the Committee agreed that a second promotional folder be prepared, but rejected the idea of a calendar which would be offered for sale to member companies.

Commenting on the favorable way the first folder had been received, Mr. Huschke told about the distribution of 16,000 folders by Ohio bankers. Horace Krause pointed to the need for distribution of literature to school children in rural communities who will be the farmers of tomorrow.

The Executive Committee voted to have the chairman appoint a committee to draw up a statement of policy with respect to support of A. A. A.. No action was taken on the selection of a seal for the Division or on the matter of a reporting service on A. A. A. bids.



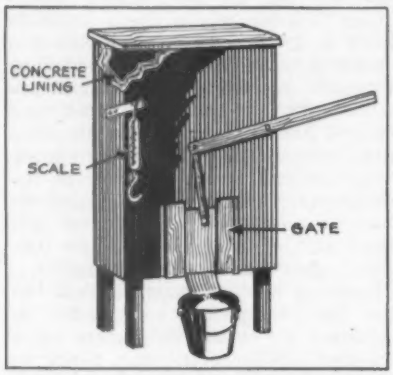
Members of the Executive Committee and guests attending meeting at the Edgewater Beach Hotel. Seated, left to right: Henry Huschke, managing director; S. P. Moore, chairman; and J. R. Boyd, secretary-treasurer. Standing, left to right: Paul Detwiler, R. S. Torgerson, ROCK PRODUCTS, guest; E. E. Haapala, Otho Graves, Philip E. Heim, Stanley Phillips, Pit and Quarry, guest; and Horace Krause, representing his father, E. J. Krause

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THE ACCOMPANYING ILLUSTRATION shows a convenient method of handling admixtures for ready mixed



Convenient arrangement for storage and handling of admixtures for concrete

concrete, devised by the H. G. Anderson Sons Co., Columbus, Ohio. The company had formerly proportioned the powdered admix by dumping it from the bag containers directly into buckets, but this proved a clumsy and wasteful method of handling. Material is now emptied from the bags into the box for storage and is fed through the gate in the front to the bucket as it is needed.

The box has a capacity of two sacks, or 200 lb., and is lined on the inside with concrete and on the outside with insulating board. The bottom slopes toward the gate to facilitate the flow. The bucket is hung on the scale to determine when the proper amount has been added.

Foundation Piers

LOUISIANA CONCRETE PRODUCTS CO., INC., Baton Rouge, La., making concrete foundation piers for small homes and outbuildings in company-made steel forms, has invented a simple method of removing the unit from the mold after the concrete has hardened. As shown in the accompanying illustration, the top of the form has a small hole into which the screw of a C clamp is placed. The sides of the clamp are secured under the sides of the form and when the screw is tightened, it pushes the concrete unit at the same time as it raises the form, thus breaking the adhesive attachment of the concrete to the form and releasing the unit.



Mold for casting foundation pier, in foreground, with finished pier and poured forms, in background

Wheelbarrow Proportioning

FAULKNER CONCRETE PIPE CO., Meridian, Miss., has devised a method of accurate volumetric measurement of



Wooden divider, in several sizes, determines correct quantity of concrete in wheelbarrow for small jobs

aggregates before introduction to the mixer. As shown in the illustration, a framework of wood has been constructed and placed in a wheelbarrow thus restricting the space into which the aggregates are placed. The "struck" volume of the barrow has been determined, and the volume of the remaining space is known when the framework is in place. Several of these frameworks have been made to conform to the shape of the barrow, each giving a different volume, so that any desired amount of aggregate may be measured.

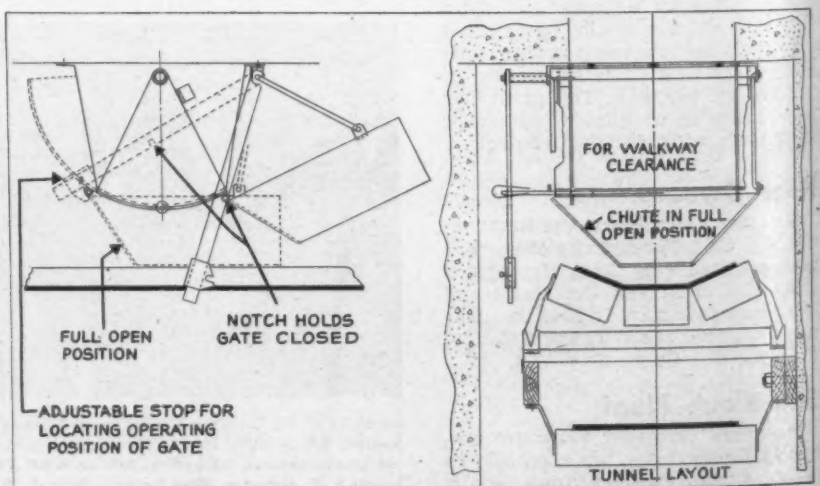
Hydraulic Classifier

A NEW TYPE of rapid hydraulic classifier for iron ore is described in a recent Bureau of Mines Report, "Performance of a Hydraulic Classifier Designed to Incorporate Four Hitherto Neglected Principles." The new classifier, used successfully for several months in a Birmingham, Ala., iron ore mill, achieves unusually high efficiency by the application of four construction principles generally overlooked in iron ore classifiers. Reports on the operation tell of a considerable saving in time and the elimination of an intermediate process because the new classifier recovers four tons of concentrates per hour from table middlings that otherwise would require regrinding and retabling.

Tunnel Gate Fill Valve

PINELLAS LUMBER CO., St. Petersburg, Fla., recently made some improvements in its equipment for handling aggregates. In the accompanying illustration is shown details of a tunnel gate fill valve with adjustable skirt feeder which is said to permit full feeding onto the belt without overload or spillage due to uneven flow. The design was worked out by C. S. Johnson Co.

It will be noted that the skirt feeder lays flat on the belt while discharging from the overhead compartment. The adjustable stop for locating the operating position of the gate when the feeder is in a horizontal or feeding position to control the opening to



Showing how tunnel gate fill valve functions to prevent spillage while providing full feed

suit the particular aggregate which is being handled. When the gate is closed, the skirt automatically raises itself above the belt so as to not interfere with other materials which are being handled from other compartments onto the belt.

Although not shown in the illustration, choker weights are provided on the clam gate to prevent interference with full closing by obstruction from aggregate particles and these weights, of course, vary with the size and weight of aggregate being handled.

Steam to Electric Drive

MONTGOMERY GRAVEL CO., Montgomery, Ala., has salvaged an old steam dragline by converting it to electric drive, from parts reclaimed

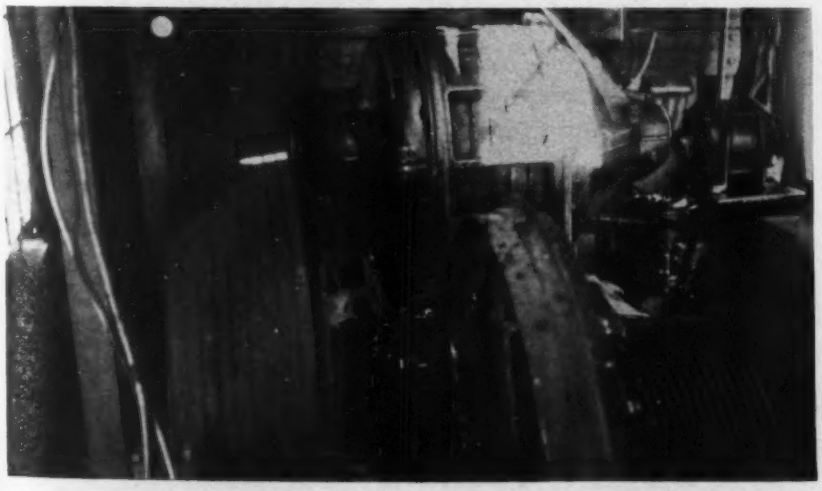


Hoist mechanism in cab of dragline is connected by a V-belt drive to 200 h. p. motor

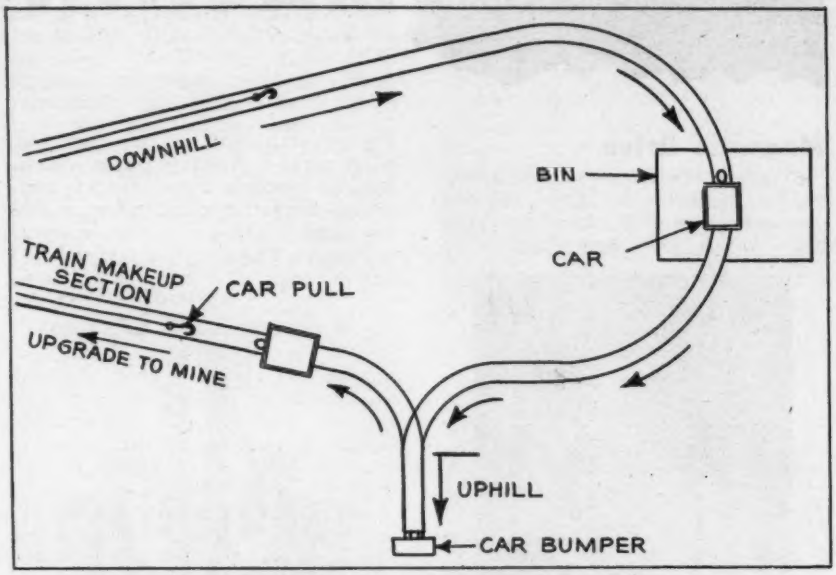
from stock. Since parts necessary for an overhaul could not be secured, and since parts for a new electric drive could not be obtained for some time, used motors and other equipment that was on hand were utilized. The change was made in 30 days. A 200-hp. G.E. motor was mounted on the old steam engine base and connected to the hoisting mechanism with a V-belt, short center, Gates Vulco rope drive. Mounted in one corner of the cab, a 50-hp. G.E. motor was connected to the swing mechanism by another V-belt drive, with an old street car controller to operate it. Included in the installation was an old street car compressor.

The capacity of the bucket on the dragline was increased from 2½- to 3¼-cu. yd., and the drag of the bucket was increased by 10 percent by figuring drives, so that this added increase in speed could be accomplished. Drives were also figured so that the belts and sheaves would be stock sizes.

The increased speed of the drag and the larger bucket have materially increased the plant production, since cars can be loaded faster.



Old steam dragline converted to electric drive loading cars. Loading speed increased 10 per cent



Showing method of turning mine cars around without power

Turning Quarry Cars Without Power

By J. F. PRUYN

IN the accompanying sketch is shown how one company solved the problem of letting trains or single mine cars down on a cable. The cars were dumped and then pushed out on a turntable to get them turned around for the pull up to the mine. It was a man killing job and costly. The arrangement shown in the sketch relieved three men and made the whole operation of dumping and making up trains automatic.

Determine Power Costs

IN order to get a more accurate breakdown of its production costs per ton of crushed stone output the Liberty Limestone Corp., Buchanan, Va., has been utilizing kilowatt-hour meters to determine power costs. Reasoning that an accurate competitive cost cannot be set for the stone unless the production costs are known, and the production costs cannot be determined until the power cost for each product is known, the company has installed these instruments in the circuits of the motors of its pulverizing units.

The instruments soon paid for themselves, and in at least one case it was found that a product was actually being sold at a loss. In addition to the kilowatt-hour meters, the company uses an hour meter to tell the total time the crusher is in operation, and ammeters to see that the units are operating at full load. Power for the instruments is drawn off the main power lines to the machines, with a transformer set in each circuit to drop the voltage down to the instrument requirements.

new MACHINERY

Magnetic Drive

ELECTRIC MACHINERY MANUFACTURING CO., Minneapolis, Minn., has announced a magnetic adjustable-speed drive which has been designed to



Model of magnetic adjustable-speed drive

give precise, wide-range, quick-response speed control for boiler draft fans, centrifugal pumps, blowers and compressors.

Consisting of two operating parts, a rotating ring and a rotating magnet, the magnetic drive is a compact electro-magnetic torque transmitter used in combination with a constant speed a.-c. motor and an electronic controller to provide split-revolution speed control. It is built in ratings approximately 25 hp. and larger at 1800 to 600 r.p.m.

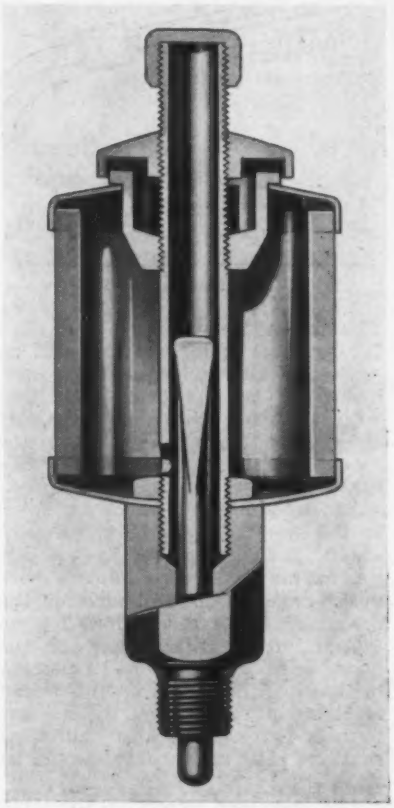
The drive is said to provide substantial power savings by operating boiler draft fans at reduced fan speed for partial fan output, eliminating the need for damper or inlet vane control. Life of induced draft fans operating in erosive gases is increased due to use of reduced speeds at partial fan outputs.

This drive also can be used in combination with synchronous motors to provide power factor correction, it is claimed.

Vibrating Rod Bottle Oiler

OIL-RITE CORPORATION, Milwaukee, Wis., has announced its vibrating rod bottle oiler, details of which are shown in the illustration. It is refilled without removal from its installation.

It is used on plain sleeve bearings, line shaft bearings, pack shafts, and spindles where light or medium bodied oils are satisfactory. Oil is fed from an air-tight reservoir through an oil port to a feed rod which slides freely in a closely fitted hole in the base and rides lightly on the journal. A slight vibration is caused by the directional drag of the rotating shaft on the feed rod, resulting in a pumping action. As the bearing becomes warm, heat is conducted through the rod to the reserve oil, causing the air in the reservoir to expand. The pumping and thermal action forces oil to creep slowly down



Cut-away view of vibrating rod bottle oiler

the feed rod to the bearing. When the shaft is not in motion, vibration of the feed rod ceases, bearing cools down and flow of oil stops.

Diaphragm Switch

AEROTEC CO., White Plains, N. Y., has developed a sensitive diaphragm pressure switch for many industrial



Diaphragm type pressure switch

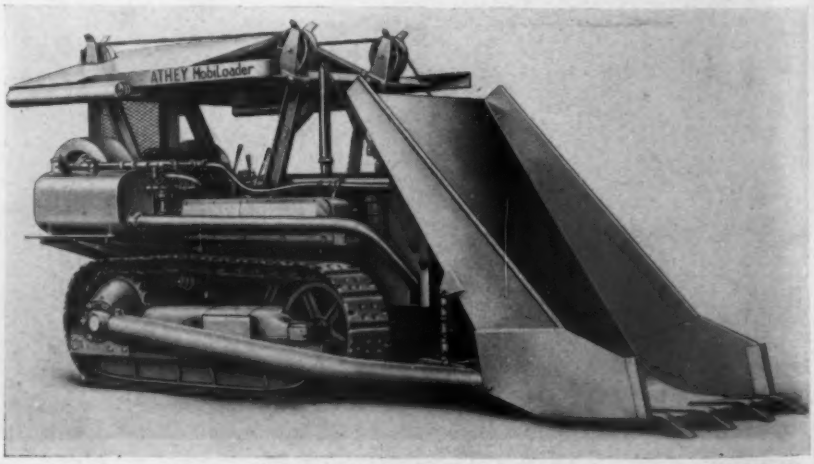
applications which was originally designed to automatically control the intercooler flap on fighter planes. Specifications show a sensitivity of 1/100 of an inch of water on stationary applications.

This instrument may be adjusted by means of two knobs to any pressure value desired. For accurately determining these pressures, a draft gauge may be connected in parallel with the pressure switch.

In the February issue of ROCK PRODUCTS, page 77, the cut appearing with this description was inadvertently used to illustrate another product made by this company.

Hydraulic-Operated Material Loader

ATHEY PRODUCTS CORPORATION, Chicago, Ill., has designed a MobiLoader known as model W4-5 engineered for use with the Caterpillar D4 tractor. It has a single finger tip hydraulic control which responds to the full



Light-weight streamlined loading unit

power of the tractor. The overhead loading principle is retained. Interchangeable bucket equipment is available in sizes for various types and weights of materials. In addition, an interchangeable bulldozer blade can be quickly installed on the lift arms.

Safety Brake for Hoist

GARDNER-DENVER Co., Quincy, Ill., has announced a safety feature on a hoist. It is a spring-loaded brake, which is held in the off-position by air pressure, and is available on the Model HKK hoist.

If the air supply fails for any cause, if an air hose ruptures or a line breaks, this brake is automatically applied. The brake is automatically released when the throttle valve is moved in either direction. The throttle valve will automatically return to the neutral position when released by the operator. It will hold in suspension any load within the capacity of the hoist and cannot be released until air is admitted to the motor and the load is picked up. The model HKK single drum safety hoist has a rated vertical lift of 2000 lbs. at 80 lbs. air pressure.

Truck Loader

MARION MACHINE Co., Marion, N. C., has developed the Owen loader as a digging and loading unit for attachment to standard truck bodies. It is claimed that it is especially useful in loading loose material; such as, sand and gravel, crushed stone, and coal. It also may be used to remove snow and for road maintenance.

The bucket has a width of 6 ft. 10 in., and a capacity of ⅓ cu. yd. The Model A Owen loader is designed for 1½-ton trucks. It is hydraulically operated from the cab by two levers, the two cylinders being controlled through a unit valve.





Two views of loader; above, showing full bucket being raised over top of truck cab for dumping, and below, the truck body in dumping position and the empty bucket being raised over cab

In digging, the hydraulic bucket ram exerts a crowding impulse against the loading arm, reducing strain on the truck chassis. This operation is through an "elbow and shoulder" movement, the bucket traveling in two small arcs rather than one big arc. It is claimed that the elbow action through the hydraulic piston provides a positive, pouring action. For road maintenance and snow removal, the hydraulic ram forms a shock absorber when hitting obstacles.

High Discharge Concrete Haulage Unit

MAXON CONSTRUCTION Co., INC., Dayton, Ohio, has brought out an improved design of Dumpcrete for transporting air-entrained concrete from a central mixing plant to the job site. The design permits discharge of concrete as high as 6 ft. 3 in. from the ground level, the hydraulic hoisting mechanism providing a dumping angle of 90 deg. This dumping angle



Concrete haulage unit in dumping position

and the rounded corners make possible a clean, fast discharge.

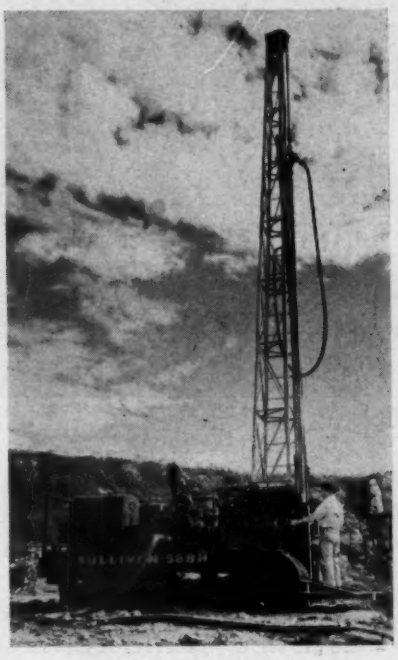
An adjustable baffle, deflector plates, and an inverted center keel provide a discharge similar to that of a bottom-dump bucket. Standard equipment also includes a specially designed gate, a hopper for directional discharge, and two sections of chute, one 5 ft. 6 in. in length and the other 5 ft. The gate may be easily removed for hauling other materials.

It is produced in two models, 2C and 4C, with respective rated concrete capacities of 2 and 4 cu. yds. Struck volumes are 3.5 and 6.25 cu. yds. Height of discharge is 4 ft. 3 in. for Model 2C and 6 ft. 3 in. for Model 4C when mounted on standard truck chassis.

Rotary Blast Hole Drill

SULLIVAN MACHINERY Co., Michigan City, Ind., has developed a rotary blast-hole drill, applying the principles of successful oil field practice. The Sullivan 56 BH rotary is said to have up to 3½ times the speed of the conventional quarry drill and costs per foot drilled are claimed to be approximately half.

The 56 BH will drill to 90 ft. and more in depth under average drilling conditions. Holes up to 9 in. in diameter can be drilled. Mounted on crawler type treads, it is self-propelling, and power is obtained either from dual electric motors mounted on



Rapid drilling with blast hole drill

a heavy-duty steel chassis. The same power used for propulsion of the unit also actuates the drilling mechanism. The 30-ft. mast is equipped with heavy duty sheaves.

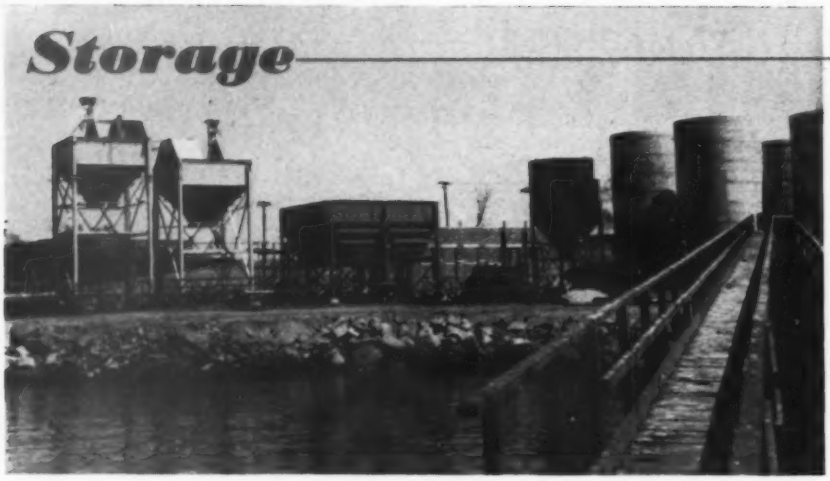
Improved Excavator

TRACKSON Co., Milwaukee, Wis., has announced its Model IT4, mounted on and powered by a Caterpillar Model D4 track-type tractor. The



Hoisting mechanism for bucket is driven from power take-off of tractor through V-belt drive. Bucket can be dumped from any point of lift, and has digging range from 14 in. below track line to 56 in. above

standard bucket is one cubic yard capacity, and is said to have many advantages for digging, excavating, grading, loading, and material handling. As the bucket is wider than the tractor tracks, it will trim close alongside walls and curbs. A bulldozer blade or angle grader and other attachments can be quickly installed in place of the bucket, and the tractor drawbar is always free for hauling work.



Dry batching plant and ready mixed concrete plant facilities with concrete storage silos to right

Metropolitan Sand and Gravel Corporation constructs three distribution plants to serve dealers with dry-batched aggregates and ready mixed concrete. Plants are located for convenient barge hauls from production facilities

Distribution Plants Cut Handling Costs

By BROR NORDBERG

THREE distribution plants for sand and gravel, dry batched aggregates, the batching of ready-mixed concrete and bulk cement will soon have been completed by the Metropolitan Sand and Gravel Corp., Port Washington, N. Y., to serve dealers in the New York City area. This step, to provide dealers with loading and batching service, represents a new practice for the industry in the city of New York which, traditionally, has been set up for outlets from producers' plants through dealers' bins and facilities at numerous locations. The most economical means of transportation for sand and gravel, largely produced on Long Island, into the metropolitan area is by water and these three distribution plants are set up to accommodate water delivery exclusively.

Metropolitan operates two large capacity sand and gravel producing plants on Long Island, one at Port Washington on Hempstead Bay and the other at Northport and, for many years, has transported aggregates in scows towed by tugs 20-odd miles into New York City ports and to New Jersey and Connecticut ports. Both these plants had been rebuilt and modernized within the past few years for economical post-war operation, with high-speed loading by belt conveyors into deck scows and the new development, distribution plants, was undertaken to balance transportation capacity with productive capacity.

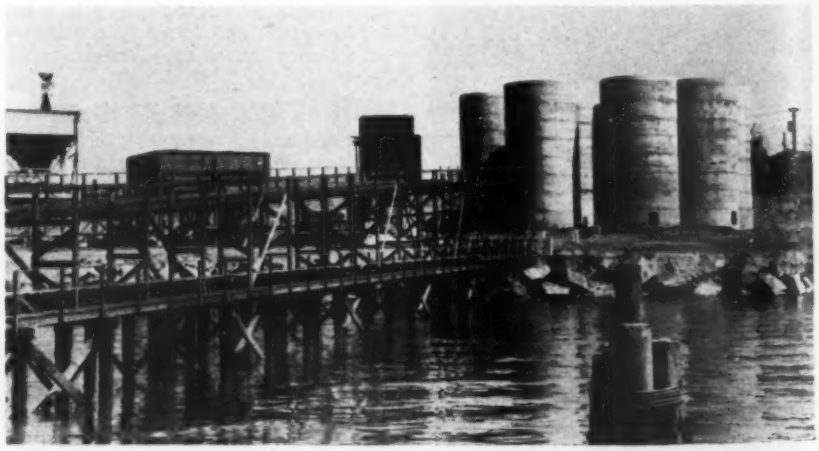
Improve Transportation Set Up

Practice has been to handle transportation from stake boats, one in Hempstead Bay, another in the East river and a third near the Statue of Liberty in lower Manhattan, from which loaded scows were towed to various destinations individually and to which empty scows were returned for the return tow to the producing plants. Some 16 to 20 deck scows would be towed to and from these "assembly" locations. Scows, or barges, have capacities of 500 to 750 cu. yd. and the company has had to have 70 in service with four Diesel-powered towboats.

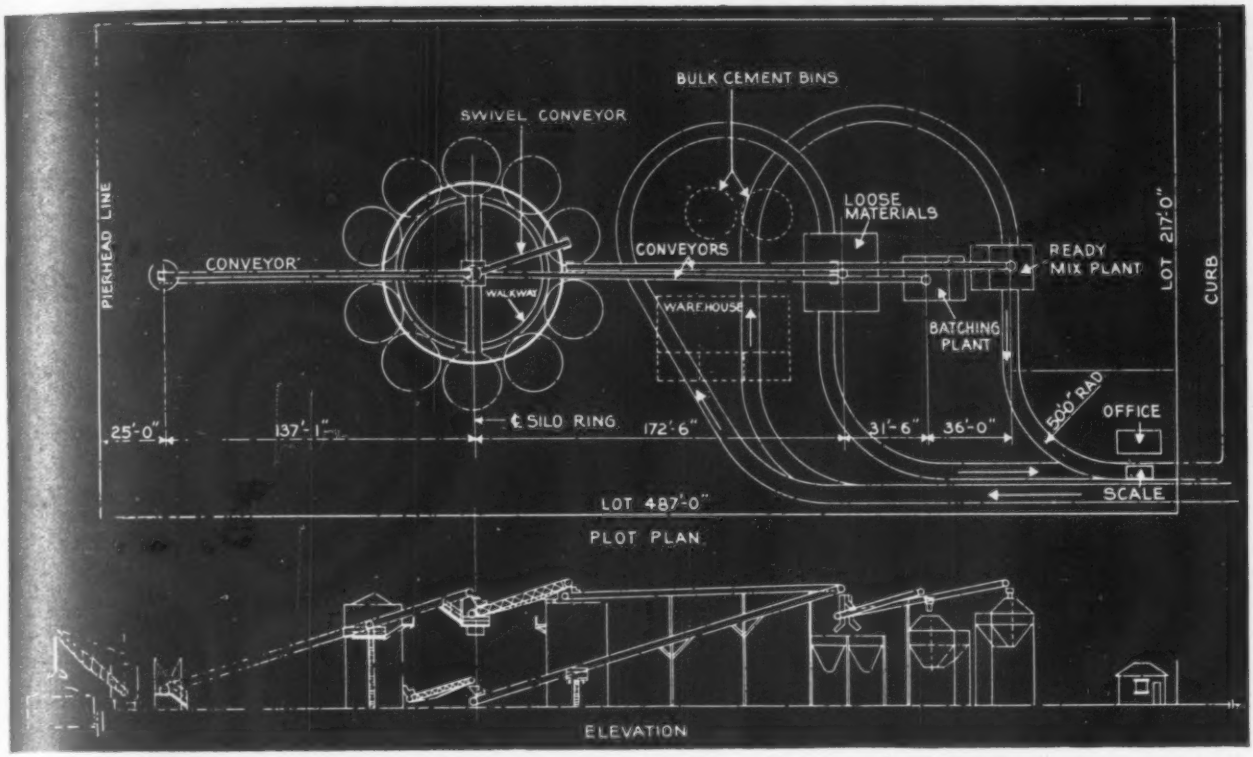
Principal purpose of the new distribution plants, other than to render a unique service to purchasers, is to eliminate much of the inefficiency of this system of transportation by enabling faster turn-around time for floating equipment. A greater volume of towing capacity per tug is sought through speed up of the handling and unloading of scows.

Most of the bin facilities that have been served are located up shallow creeks and streams that empty into the East river. There were some 30 destination points so located, requiring the tow of single scows from the stake boats up these streams at high tide and, similarly, a return tow at times when the scows could be refloated. The scows would, in effect, serve as storage until emptied by clamshell and require a towboat, sometimes rented, for the haul to and from the stake boat.

The new plan for distribution, soon to go into service, will reduce the necessity for tows up these creeks entirely and the main channels of deep water will be available directly to the new distribution plants. Unloading piers are being built out into the East river some 250 ft. from two of the new locations, and dock facilities at the third location will permit direct tie-up of loaded barges. It is anticipated that one tug will be able to accomplish the work of two, under the old system, and that a complete round trip from the producing plants, dropping barges directly at each of



Construction view of Bronx distributing plant showing reinforced concrete storage silos and conveyor structure



Layout of one of three distribution plants built by Metropolitan Sand and Gravel Corporation to serve metropolitan New York City. Of particular interest is circular arrangement of reinforced concrete silos with overhead swivel belt conveyor for filling silos and similar set up for reclaiming aggregates to working bins over belt conveyors

three destinations, and picking up empties for return will be completed in much less time than formerly. The cycle has been, more or less, a never-ending process. It is estimated that the transportation cost will be halved. New Jersey and Connecticut points will be served in the usual way.

The distribution plants are so located that some 85 percent of the construction falls within four miles of the plant. One plant is on the East river at the foot of Tiffany St. in the Bronx; a second is on the East river at Newton Creek in the Greenpoint section of Brooklyn; and the third is on Flushing Bay.

Concrete and Steel Construction

All three plants are of reinforced concrete and steel construction, and are of identical design except for a few variations. The accompanying layout plan for one of the plants is representative. The Bronx and Flushing Bay plants have piers extending some 250 ft. out to deep water, while the Brooklyn plant will unload from scows tied up alongside a bulkhead. The circle of storage silos shown in the plan is the same at all locations except there are ten 1000-cu. yd. silos at two plants and nine at the Bronx plant. Considerable piling was required at the Brooklyn location and, at Flushing Bay, it was necessary to dredge a 12-ft. boat basin to create a 200 ft. channel, 100 ft. wide, from the main channel to the mooring basin.

Each plant is designed to render complete and speedy service. Bulk aggregates including sand, gravel, crushed stone and cinders are available in a number of sizes and may be loaded into trucks as loose materials or dry-batched for concrete paving. Bulk cement, received by water, is available for batching ready-mixed concrete or for retail sale and batching facilities are provided for ready-mixed concrete trucks.

Storage and Handling System

The plants have great capacity and flexibility and some of the design features are extremely interesting.

All intra-plant handling is by belt conveyor and the sequence, from the water front in each case, consists of a nest of nine or ten 1000-cu. yd. concrete storage silos, bulk cement bins and warehouse, loose materials bins, dry-batching plant and ready-mixed concrete batching plant.

A Whirley with 2-cu. yd. bucket will be located at the end of each pier, a gantry at Brooklyn, to unload sand and gravel at the rate of 200 cu. yd. per hour to a hopper feeding a 30-in. belt conveyor. This primary belt transfers to a swivelled belt conveyor serving all the main concrete silo storage bins or to a belt conveyor system with great flexibility to fill directly the loose materials bins or either of the compartments in the two batching plants. The swivelling conveyor has the tail pulley mounted on a turntable and head pulley on a double flange wheel traveling over a circular rail. It has a remote control motor drive. Capacity, in silos, is 10,000 cu. yd. (9000 cu. yd. at the Bronx plant). On the outside of each silo, additional storage is provided through spillout gates, some 6 ft. above the ground level, and the spillout material will be loaded into trucks by portable bucket loaders.

A similar swivelled conveyor is provided at the bottom of the silos for reclaiming sand and gravel by belt conveyors to either of the loose materials bins or any compartment of the two Butler batching plants.

Twelve aggregates bins are provided at each location. Four 50-cu. yd. aggregates bins are drawn from for dry batching into trucks; four of identical capacity for ready-mixed concrete; and there are four 150-cu. yd. steel bins for the loading of loose materials into trucks. A 2-cu. yd. Butler Aggremeter will proportion dry-batched aggregates and one of 6 cu. yd. the ready-mixed concrete. New York City has standardized on 6-cu. yd. transit mixers and there are some of 8 cu. yd. capacity in service.

At each location, a total capacity for 4600 bbl. of bulk cement has been provided in two Johnson main cement bins of 2000 bbl. capacity each for retail trade and two 150-bbl. compartments at each of the two batch-

(Continued on page 140)

Fifty Years of Progress

ROCK PRODUCTS CELEBRATES Fiftieth Anniversary

Reviews interesting developments over 50-year period and points to trends of the future

By NATHAN C. ROCKWOOD

CAESAR'S COMMENTARIES, which all my generation, at least, had to "read" in Latin, as part of their high school education in the classics, starts out "all Gaul is divided into three parts." So, we might as well start these "classical commentaries" by saying "all ROCK PRODUCTS is divided into three components. These three components in order of their birth were (1) the monthly journal CEMENT AND ENGINEERING NEWS, established in Chicago, in July, 1896; (2) ROCK PRODUCTS, established in Louisville, Ky., April, 1902; and CONCRETE PRODUCTS, established originally as the *Cement Era*, presumably in January, 1903, at Chicago. The early history of this latter journal is somewhat lost in obscurity, because its publisher did not provide a complete file of the publication at the time of its sale to ROCK PRODUCTS. Probably, its early issues covered much the same field as its older contemporary, CEMENT AND ENGINEERING NEWS.

Since it is usual to celebrate as a publication's birthday, the birthday of its oldest component, this June, 1946, issue of ROCK PRODUCTS celebrates the close of a half century's service to the American cement and allied industries—our Golden Anniversary. None of us on the present staff of ROCK PRODUCTS is old enough to have had a hand in the founding of the journal in 1896. The writer's own record of almost 29 years with ROCK PRODUCTS, and eight previous years with *Engineering News* and its successor, *Engineering News-Record* in New York, is by far the longest experience in this field.

My own first knowledge of the existence of CEMENT AND ENGINEERING NEWS was while on the editorial staff of *Engineering News* in New York in the days when its founder, George H. Frost, was still publisher. He once told me about this upstart Chicago journal which was infringing on the name of his own publication, and how he had tried through a lawsuit to prevent the use of the "Engineering News" part of its title. However, William Seafert, the editor and publisher of the new Chicago journal, won out by insisting that the emphasis was on "Cement News," and his journal persisted until after his death, when it was bought and absorbed by the publishers of ROCK PRODUCTS, in October, 1924.

A Mine of Interesting Facts

Since our absorption of this *Cement and Engineering News* component of ROCK PRODUCTS, I have passed many pleasant and contemplative hours thumbing through the pages of its early issues. The impression I always get is one of how much useful information may be read and forgotten, only to be later resurrected and proclaimed again as a special new discovery. For, in spite of all the subsequent increase in knowledge of chemistry and physics, the ills and the virtues of cement and concrete were probably as thoroughly understood in a practical way in 1896 as in 1946. The early literature at least had the advantage of being more closely related to good practice in concrete construction, for much of that old-time concrete is apparently still good. If it were not, many of our downtown buildings in Chicago would have collapsed, for they rest on rafts or platforms of reinforced concrete.

So, at a time when cement was used largely for sidewalks and building foundations, William Seafert started the first journal in the United States to serve its infant cement industry. There were no doubts in the mind of the publisher as to the task cut out for his new publication. This is adequately described in the first three paragraphs of his introductory editorial as follows:

"The literature pertaining to the cement industry lies scattered in loose array through a thousand and one periodicals. It exists in the archives of innumerable learned societies.

"No great university, at home or abroad, is considered complete without its special department equipped with instruments of precision for making engineering tests, especially of cement, yet the cement industry is without its distinct periodical literature.

"We propose to invade the field, in the interest of the cement trade and kindred industries; establish and maintain a monthly journal that shall be a vehicle for the expression of sound ideas pertaining to the development and general welfare of the trade. We shall endeavor to bring the producer and consumer closer together, to their mutual advantage."

The early service of this journal did consist primarily of gathering, reprinting and abstracting articles on cement and concrete construction from many sources both at home and abroad, and therein lies the value today of its bound volumes. One would have to seek far and wide for many of the early classics of the industry, which were gathered in these volumes by its enterprising editor and publisher.

The first issue contained the beginning of a series of articles on "The Manufacture and Testing of Portland Cement," by Henry Faija, based on a paper in the Transactions of the American Society of Civil Engineers. This is of interest, even today, for it



CEMENT AND ENGINEERING NEWS.
(PUBLISHED MONTHLY)
WILLIAM SEAFERT, Editor and Publisher.

OFFICE—161 LA SALLE STREET.

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Front page, double regular rates.
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We invite correspondence in all matters pertaining to the cement trade.

"This world belongs to the energetic."

Chicago, July, 1896.

Reproduction of original masthead of Cement and Engineering News, predecessor of ROCK PRODUCTS

gives the following composition of the portland cement of that day:

"The lime may vary from 58 to 64 percent.

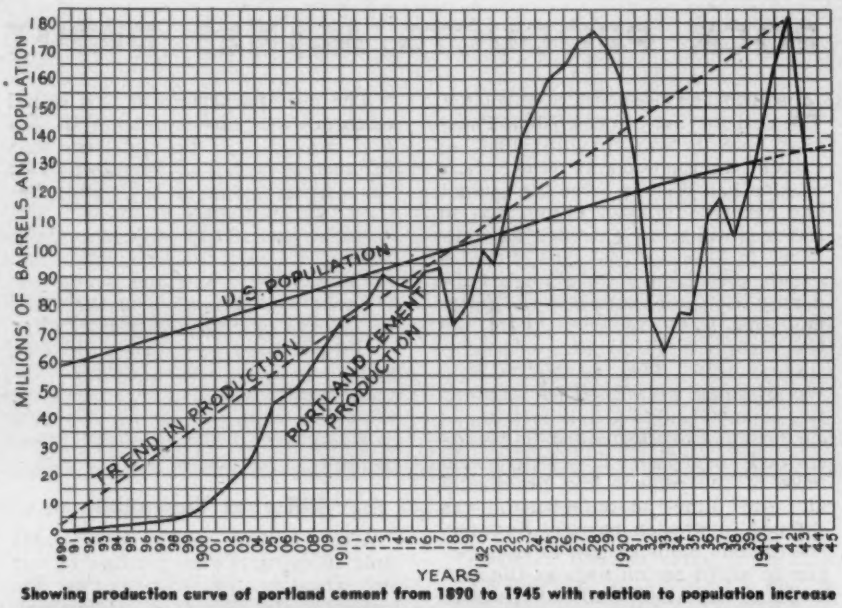
"The silica may vary from 18 to 24 percent.

"The alumina and iron from 8 to 14 percent."

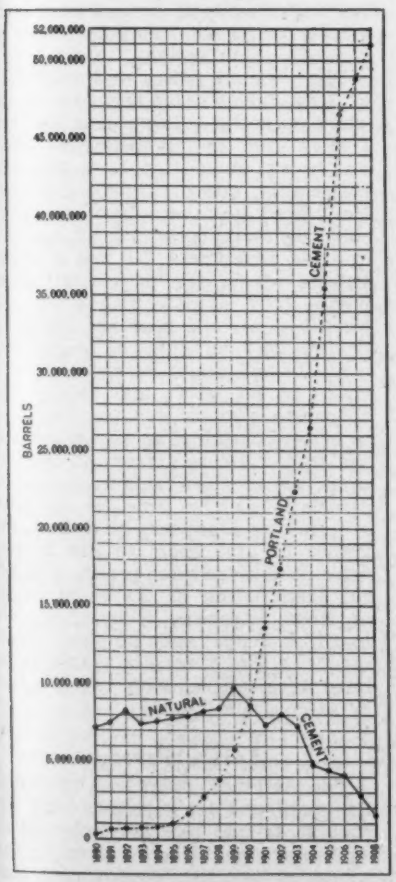
The method of manufacture described in this paper was by briquetting the raw materials and calcining in shaft kilns of special design. The method of grinding recommended as most efficient in producing a good cement was by millstones, although ball mills and "edge-runner mills" had already been introduced into the industry. The millstones made more "flour."

The Cement Industry in 1896

That William Seafert was a brave man with confidence and optimism is proved by the statistics of the cement industry he set out to serve in 1896. In that year the portland cement production of the United States amounted to 1,543,023 bbls., valued at $2,424,011—less than a year's business of one moderately sized plant of today. Yet it was 56 percent larger than the output in 1895. There were 26 plants: 1 in California; 1 in South Dakota; 1 in Illinois; 1 in Indiana; 1 in Michigan; 7 in New York State; 2 in New Jersey; 4 in Ohio; 7 in Pennsylvania; 1 in Texas; there had been one reporting from Utah in 1895. The output of natural hydraulic cements in 1896 was 7,970,450 bbls. from 67 plants.



Showing production curve of portland cement from 1890 to 1945 with relation to population increase



Curves comparing Portland and natural cement production from 1890 to 1908

Imports of portland cement in 1896 were 2,989,597 bbls., or nearly twice the American output. About half of the imports came from Germany and most of the rest was about evenly divided between Great Britain and Belgium. However, the imports had decreased slightly from those of the previous year, so that the confident ones could see the turning of the tide. Incidentally, imports continued for some time to be a large factor in American concrete construction, not merely because with cheap labor cost of manufacture, it could be sold at a lower price, but because, it seems, the importers had some kind of an "in transit" railway freight rate in combination with the steamship companies, which permitted imported cement to be shipped to Chicago, Kansas City, Omaha, etc., from ports of entry, at lower rates than Eastern United States cement manufacturers were able to obtain.

However, 1896 was the year of the great "hard money" fight between McKinley and Bryan, which old-timers will remember, if only as kids, because there probably never was a presidential election in which the opposing groups in our commonwealth took such decided attitudes toward something no one knew very much about. Anyhow, a Republican administration under William McKinley, author of the highest protective tariff up to that time, did not long delay getting through a new tariff act—the Dingley Act—which eventually discouraged foreign manufacturers of portland cement. In the meantime American manufacturers had learned to make better cement, partly, we hope, through the assistance given them by the publication of technical articles for their benefit by our CEMENT AND ENGINEERING NEWS.

In 1896, by the way, over 1,000,000 bbls. of the total 1,500,000 bbls. for the country as a whole, came from Lehigh County in Pennsylvania and Phillipsburg, N. J. Another interesting fact about the portland cement industry in 1896 is that 910,653 bbls. of the output were manufactured in vertical kilns (continuous and intermittent types) and 632,370 bbls. were manufactured in rotary kilns—only 41 percent of the total. The slow progress in adoption of rotary kilns prior to 1896 is shown by the same statistics of the U. S. Geological Survey: in 1893, 25.2 percent of domestic portland cement made in rotary kilns; in 1894, 30.3 percent; in 1895, 40.5 percent. The Survey report for 1936 said: "The Aalborg, or modified Shoefer, continuous (shaft) kiln is coming rapidly into use in this country."

The general adoption of the rotary kiln was somewhat delayed by early patent controversies, but eventually it became apparent to American cement manufacturers that labor economies here were far more important than fuel economy, which was the controlling factor in the plants of their European competitors. After the universal adoption of the rotary kiln in this country, there have been no radical changes in the processes of portland cement manufacture.

ROCK PRODUCTS MAKES DEBUT

AS RECORDED elsewhere in this issue, this journal of ours, ROCK PRODUCTS, had its start in July, 1896, as CEMENT AND ENGINEERING NEWS, whose mission had been to serve the cement and concrete industry exclusively. In the meantime, an enterprising publisher in Louisville, Ky., E. H. Defebaugh, president of the Francis Publishing Co., was studying a larger field that would include cement. He was already publisher of a successful trade journal, *The Barrel and Box*. We presume he was well aware of the cement and allied industries as customers of his *Barrel and Box* readers and advertisers, for at that time most of the cement and practically all the lime manufactured was shipped in wooden barrels. However, the cement industry had already begun to adopt cotton bags as the best shipping container, and it is possible that Mr. Defebaugh, with his enthusiastic support of the wooden container industry, hoped to help his friends who made barrels. Be that as it may, No. 1, Vol. 1, of ROCK PRODUCTS, April, 1902, contained more advertising from the cooperage industry than from any other source.

Comprehensive Title

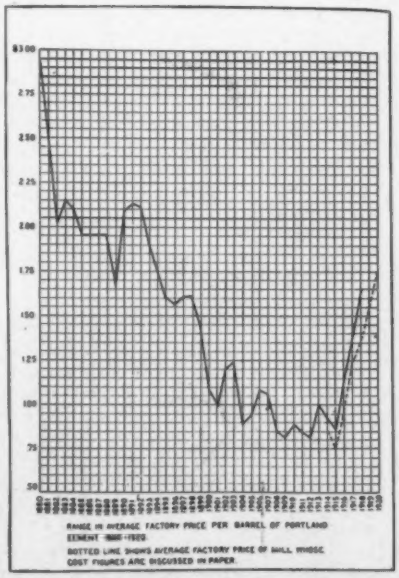
The more one considers our title or name, the more impressed he must be with its comprehensiveness. Taking it for granted that the planet we live on was originally a large gob of molten rock, it is safe to say that everything on this earth today, including ourselves, is a rock product. Even the oceans and the atmosphere are probably the products of the cooling off of this molten gob of rock —or maybe it was more than molten in the beginning, was only a mass of hot vapors—"without form and void." So, a journal to include *all* rock products was obviously beyond the scope, if not beyond the imagination of the founders of ROCK PRODUCTS. Nevertheless, as the masthead of the first issue proves, the field to be covered was sufficiently comprehensive, and shows a publisher not only ambitious but with vision.

In addition to the "mission" outlined in the masthead, the first editorial was entitled "Our Mission," in which the editor stated it to be "to serve the trade in every honorable way possible, and to do it so persistently and thoroughly as to not only merit the support of the trade, but get it. We know there are already papers covering parts of the field before us, but we propose to cover the whole field; not in a lifeless manner, but we will coöperate with a will, both editorially and personally, in any and all movements to better the conditions in any branch of the trade."

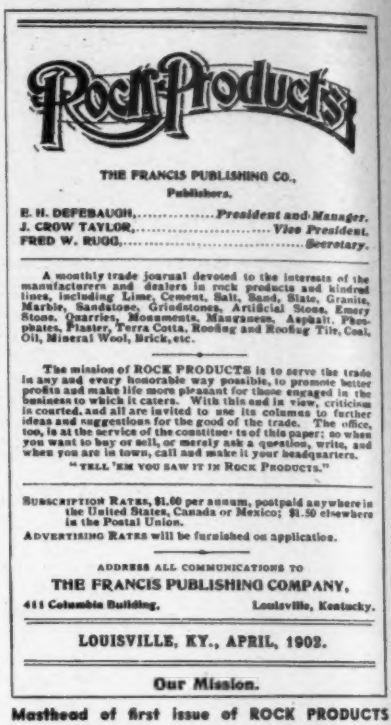
The next paragraph of this initial editorial was an expression of the firm conviction of the publisher that his success with *The Barrel and Box* "is a living attest of the ability behind the present enterprise." The editorial wound up with this: "To sum up, we have money enough, and the newspaper brains, too, we believe, to make a paper to which the trade will give hearty support, and we want to see how soon we can build this paper up to 100 pages. So read the issue carefully, and if you don't see what you want, ask for it—just give us a chance to please you—and watch us grow."

Different Viewpoints

After having spent considerable time studying the early issues of our two ancestral publications, we are struck by the difference in approach to the missions they had set out separately to achieve. I never knew the editor and publisher of CEMENT AND ENGINEERING NEWS personally, and I never examined its contents critically until after it was absorbed into ROCK PRODUCTS. It is obvious to me now that its editor was of the swivel-chair type, who made excellent use of paste pot and shears. He did, however, get out a publication that was useful and had sufficient merit to attract the attention of leaders in the cement industry, who frequently made original contributions. It was, primarily, a compendium of current literature on cement and concrete. CEMENT AND ENGINEERING NEWS also won the support of nearly all the early manufacturers of cement-plant machinery, and



Range in average factory price per barrel of portland cement from 1890 to 1920



Rock Products

THE FRANCIS PUBLISHING CO.,
Publishers.

E. H. DEFEBAUGH,.....*President and Manager.*
J. CROW TAYLOR,.....*Vice President.*
FRED W. RUGG,.....*Secretary.*

A monthly trade journal devoted to the interests of the manufacturers and dealers in rock products and kindred lines, including Lime, Cement, Salt, Sand, Slate, Granite, Marble, Sandstone, Grindstones, Artificial Stone, Emery Stone, Quarries, Monuments, Manganese, Asphalt, Phosphates, Plaster, Terra Cotta, Roofing and Roofing Tile, Coal, Oil, Mineral Wool, Brick, etc.

The mission of ROCK PRODUCTS is to serve the trade in any and every honorable way possible, to promote better profits and make life more pleasant for those engaged in the business to which it caters. With this end in view, criticism is courted, and all are invited to use its columns to further ideas and suggestions for the good of the trade. The office, too, is at the service of the constituents of this paper; so when you want to buy or sell, or merely ask a question, write, and when you are in town, call and make it your headquarters.

"TELL 'EM YOU SAW IT IN ROCK PRODUCTS."

SUBSCRIPTION RATES, $1.00 per annum, postpaid anywhere in the United States, Canada or Mexico; $1.50 elsewhere in the Postal Union.

ADVERTISING RATES will be furnished on application.

ADDRESS ALL COMMUNICATIONS TO
THE FRANCIS PUBLISHING COMPANY,
411 Columbia Building. Louisville, Kentucky.

LOUISVILLE, KY., APRIL, 1902.

Our Mission.

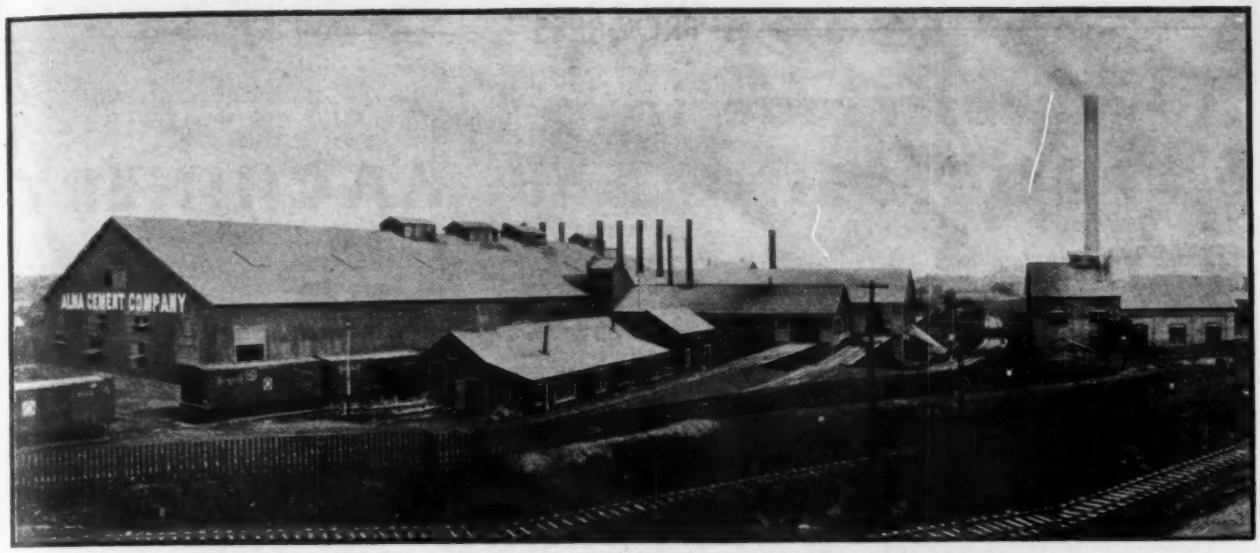
Masthead of first issue of ROCK PRODUCTS

through them, apparently, was able to publish descriptions of many of the early portland cement plants in greater detail than may be found in any other publication.

The original editor and publisher of ROCK PRODUCTS, on the other hand, was a go-getter without qualification. I knew him shortly before he died and he was unquestionably a dynamic personality, and a very likeable one. He placed great emphasis on personal contacts, both with his readers and his advertisers. He was a great entertainer in the days when that meant only a man with a rugged constitution could bear up. His publication showed that he made the contacts and doubtless spent a good share of his effort and money "to coöperate with a will—personally—to better conditions in any branch of the trade." He was, from all indications, the greatest organizer of trade associations of his time. He was forever calling producers or dealers together to urge them to ask higher prices and make more profits. A critical examination of the early issues of ROCK PRODUCTS, while there are many inspired and pungent comments, shows that the publication must have suffered from this feverish extra-curricula activity.

Later History

The original publisher of ROCK PRODUCTS and its subsequent editor, Fred K. Irvine, were not technical or engineering-minded men, and in the course of time they became more interested in the dealer angle of the publication than in the producer side.



One of the first rotary kiln portland cement plants in the United States, Alma Cement Co.

Also, they learned by experience that they had embraced too broad a field; they could not serve whole-heartedly such competitive industries as brick and portland cement. They failed to make much of an impression on the portland cement industry, except as an advertising medium to reach dealers. Mr. Defebaugh did, however, become very active in the lime industry and was responsible for the organization of the National Lime Manufacturers' Association in January, 1903. He and his editor, Mr. Irvine, were successively secretary of the association for many years, and ROCK PRODUCTS came to be known as the "lime man's bible."

In the 15 years which followed the founding of ROCK PRODUCTS, while it carried more editorial material and advertising addressed to the lime, quarry and sand and gravel industries than any competitor, it also became more and more a building supply dealers' journal. Indeed it had changed its name to ROCK PRODUCTS AND BUILDING MATERIALS. It had also become a fortnightly journal instead of a monthly, increasing its subscription price to $2 per year; the publication headquarters were moved from Louisville to Chicago. At the end of these 15 years, our country was in the midst of World War I and the outlook for building materials, and building material dealers, was black indeed. I suspect the publisher, who was growing old and slowing down, could not see much in the immediate future for his publication, ROCK PRODUCTS AND BUILDING MATERIALS, so he parted with it to W. D. Callender, president of a young and ambitious publishing concern, known as the Tradepress Publishing Corp.

Mr. Callender had started out in the publishing business on his own a few years before by founding a monthly journal, *Motor Cycling and Bicycling*, which was an outstanding financial success. However, at one period of his long experience in the publishing business, Mr. Callender had been the manager of *Engineering and Mining Journal* under its early publisher, John A. Hill, consequently, he could see that his purchase, ROCK PRODUCTS AND BUILDING MATERIALS, had possibilities as an industrial journal. He also knew he required a technically educated and trained editor. So, he contacted his old friends in the Hill Publishing Co. (by then the McGraw-Hill Publishing Co.) and it was here he was put in touch with the writer, who was then an associate editor of *Engineering News-Record*, having served nearly eight years on the editorial staff of *Engineering News* and its successor, *Engineering News-Record*. That was in the fall of 1917, and the present writer has been associated with ROCK PRODUCTS since then, as editor, vice-president of the Tradepress Publishing . Corp., and manager of ROCK PRODUCTS, and as president of the company upon W. D. Callender's death in 1931 until 1939, after the company's absorption by the MacLean Publishing Co. (now the MacLean-Hunter Publishing Co.) of Toronto, Ont. Two and a half years ago he "semi-retired," to become an advisor and consultant to a younger generation of editors and managers.

A Crucial Decision

Going back to 1917, the new publisher and his editor were faced with a crucial decision, whether to make ROCK PRODUCTS a building materials dealers' journal or an industrial journal devoted to the manufacture of cement, lime and gypsum products and the production of crushed stone, sand and gravel, crushed slag and similar non-metallic or industrial minerals. The decision was not a difficult one for the new editor because as an engineering journalist he felt confident of the future of the construction materials industry. The decision was difficult for the publisher because at the moment most of the journal's revenue came from building material manufacturers and was addressed to dealers. Obviously, the journal could not serve both. Fortunately, in spite of poor immediate prospects, we decided on an industrial journal, and such it has been ever since.

The first two years under its new publisher, ROCK PRODUCTS' editor was plunged into problems created by the war and its aftermath. He hustled from one association meeting to another, and following in the footsteps of his predecessor had a hand in organizing the National Crushed Stone Association and resuscitating the National Sand and Gravel Association, which had held its first meeting the year before upon the invitation of E. H. Defebaugh. There were also many state associations being organized in these industries, the National Lime Manufacturers' Association was being reorganized, the National Agricultural Limestone Association, etc., were beginning operations. Those were busy, active days and nights, but they provided unexcelled opportunity for an intimate acquaintance with the problems of the industries and with the live-wire operators in those industries.

It was not until the early 1920's that we had the time and financial resources to concentrate on assembling a staff of specialists who could give the industry the services we had previously dreamed of giving. That meant making ROCK PRODUCTS both the technical and the business journal of its industries. The "mission" of this present journal might well be described as a combination of the missions already stated as those of the original publications. We have always considered that the greatest service this or any other industrial publication can render is to make itself a part of the industry or industries it is designed to serve in "every honorable way possible."

Advances Made in PROCESSING and MACHINERY

WHILE MUCH that follows refers more specifically to the manufacture of portland cement, much also concerns the lime, crushed stone and other industries employing equipment such as power shovels, crushers, pulverizers, kilns, etc., which originally were pioneered and developed for the portland cement industry. The earliest use of quarry products, aside from the rock produced for the manufacture of lime and cement, was for railway track ballast and macadam roads. Therefore, drilling and blasting technique, and rock crushers existed before portland cement; but most of the progress in development of these came after cement manufacturers started to look for cheaper and better methods of production. We have reserved the discussion on quarrying for a separate story.

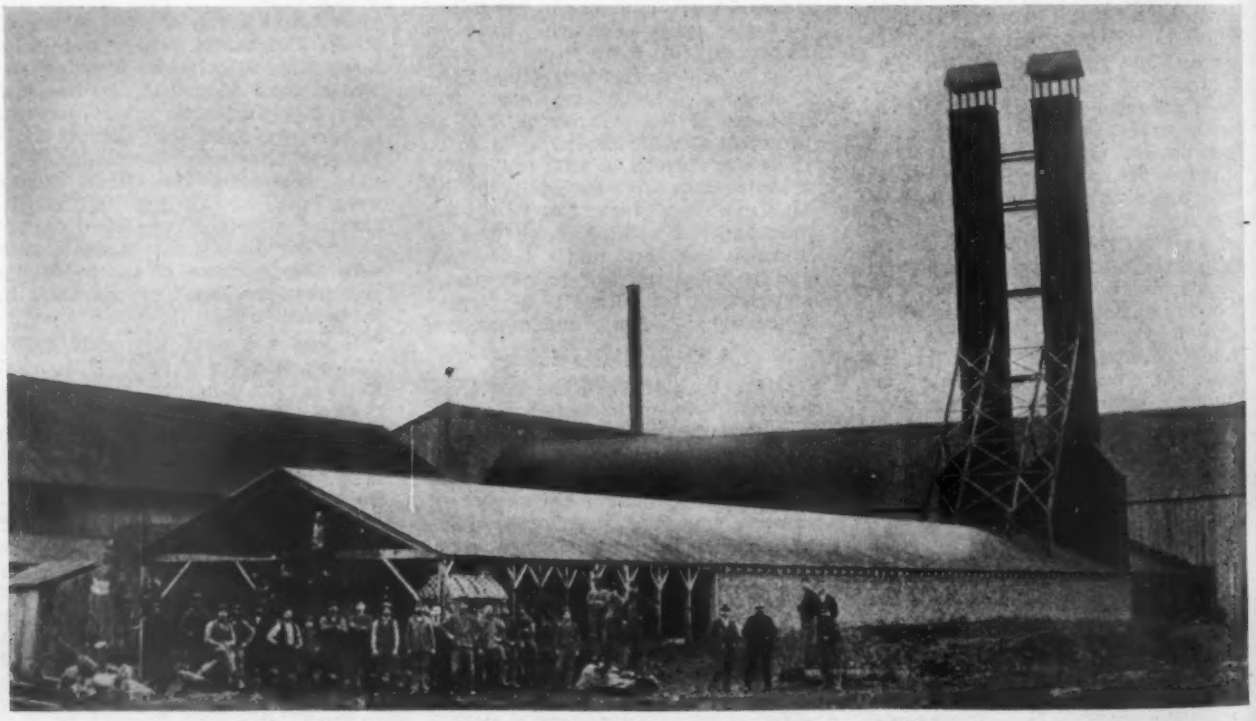
Vertical vs. Rotary Kilns

Not until about 1899 did American portland cement production of rotary kilns exceed that of vertical or shaft kilns. The shaft kilns were continuous discharge types developed in Europe. The raw materials had to be prepared wet, or moist, molded into bricks, dried, and then fed into the top of the kiln. The process required considerable hand labor, but some progress was made in reducing handling costs before this process was abandoned in favor of the rotary kiln. If the reader wants to know something about the operation of these German type, shaft-kiln plants we suggest he turn to the brief reminiscences of John Prince, elsewhere in this issue, for he was once superintendent of one.

A typical record of an early marl-clay portland cement plant is that of the Buckeye company at Bellefontaine, Ohio, already referred to in the previous article on the beginning of the industry—a successful record until its marl deposits were exhausted, the common fate of nearly all the early operations using marl. The September, 1904, issue of ROCK PRODUCTS contained a history of the operation up to that time. The plant was originally built in 1889 with Dietsch (German) shaft kilns, mixing the marl and clay wet, molding into brick and drying prior to introducing the bricks into the kilns. In 1892 four dome kilns (a larger shaft kiln type) were added, and about 1898, one rotary kiln. The dome kilns had been abandoned by 1904 and were being used as storage bins or silos for cement. Other rotary kilns had been added and all cement was then made in them.

The article concludes: "This plant has undergone more changes than any other in Ohio, and probably more than any in the United States. At one time or another every type of machinery from ancient to modern, could have been seen on the grounds, but today it is a modern plant, so far as machinery is concerned. Of course, the arrangement of this machinery is not exactly as it would have been if the plant had been built new from the ground up. The first rotary kiln was run about a year on fuel oil. Then the price of oil became too high and a gas producer was used until 1902, when a pulverized coal system was introduced, using a tube mill for grinding the coal, which has recently (1904) been abandoned. This has been replaced by the system of the Raymond Bros. Impact Pulverizer Co. This consists of a pulverizer connected with an air separator. The plant has three 70-ft. rotaries, three tube mills and seven Buhr mills."

Probably not many of the old shaft kiln plants had so complete a record as the Buckeye. They were either abandoned or burned down. Appar-



Dryer installation (1896) for White Cliffs Portland Cement & Chalk Co., White Cliffs, Ark.

ently one of the last manufacturers to abandon the shaft-kiln process, which, incidentally is still used in Europe and elsewhere, was the White Cliffs Portland Cement Co., White Cliffs, Ark., where a deposit of natural chalk exists. This company was originally known as the Southwestern Portland Cement Co.—not the present one—and had been founded largely by Holland Dutch capitalists. As late as August, 1907, an article in our journal stated that if the Holland and American capitalists could agree, each furnishing one-half the necessary funds, the plant would be rebuilt and moderized. The company had already repeatedly reorganized and overhauled its plant, but had never adopted the modern American methods (meaning use of rotary kilns), and hence had been a continuous liability. The following year 1908 the plant was sold by a referee in bankruptcy, so we presume the Holland capitalists decided to quit putting money into it. However, White Cliffs has been spasmodically in the news since then because numerous others have attempted to build a portland cement plant there. That particular chalk deposit is probably responsible for more bankruptcies than any limestone deposit in the world. We wonder why?

Expanding Rotary Kilns

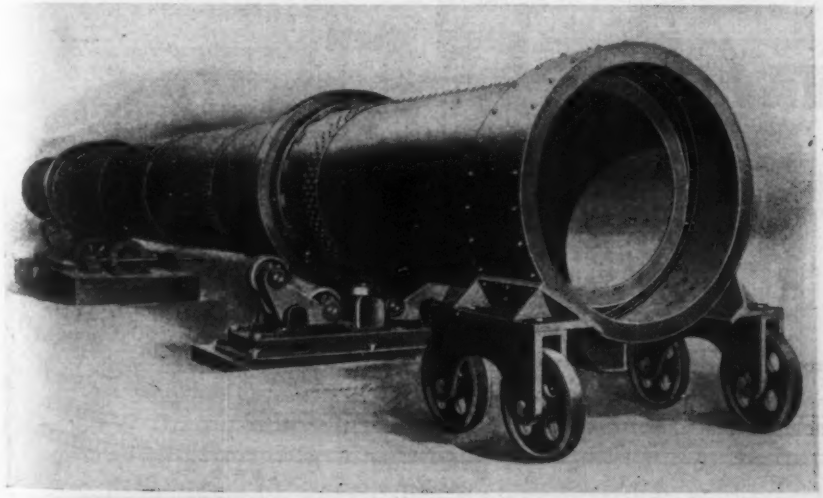
Looking back, it is strange that the possibilities of the rotary kiln were not reorganized long before 1896, when it began to come into general use in the American portland cement industry. It was invented, or developed, and patented by Siemens in Germany in 1869. Even then, he described its possible use for the manufacture of cement, lime and gypsum. He also foresaw the use of rotary kilns for roasting ores in metallurgy. This last use has come into practice only during the past few years. The original patent covered the introduction of air or steam at various points in the kiln to facilitate chemical reactions—a point that has been more or less overlooked in its use to make cement and lime. In 1885, Ransome in England got a patent for a combination of a rotary kiln and a gas producer. It was the Ransome patent or patents that Alfonso de Navarro, who helped found the Atlas Portland Cement Co., brought to the United States from England in 1888, and attempted through American patents to control the manufacture of port- and cement in rotary kilns.



Raw material was fed (1896) in the form of briquettes to vertical cement kilns

The first rotary kilns were 40 ft. long and 4 or 5 ft. in diameter (including the lining). With experience they grew gradually longer and up to 6 ft. in diameter. For a considerable time the length appeared to have settled on 60 ft. The Whitehall Portland Cement Co. plant at Cementon, Penn., was built in 1900 with ten 6x45 ft. kilns. The first break came in 1903 when Thos. A. Edison decided to go into the cement industry, literally in a big way. Everything as we shall see later, was on a grander scale than ever before conceived. His kilns were 8x150 ft.—more than twice the size of any existing kilns. They were different in other ways; they were built up of cast-iron sections and were mounted on many more rolls than other kilns—15 pairs in all, 4 ft. in diameter. They were also, apparently the first kilns with insulation between the firebrick lining and the shell—layers of sheet asbestos ½ in. thick. An attempt was made to patent these extra long kilns.

Whether it was on account of the patent, or merely conservatism, the size of kilns grew very slowly although there seems to have been no secret of the superior economy of the 150-ft. kilns. New plants continued to be built with 80 and 100-ft. kilns, usually 8 ft. in diameter. In 1907, Ellis C. Soper, designer of several plants of the period, compared tests of 7x60-ft. kilns with 8x110-ft. kilns; and decided that the 110-ft. kiln consumed 25 to 35 percent less fuel per bbl. However, he said the output of a 7½x125-ft. kiln barely equalled that of an 8x110-ft. kiln, which showed that other things than length were involved.



Wash drawing of rotary kiln used by the cement plants about 1920

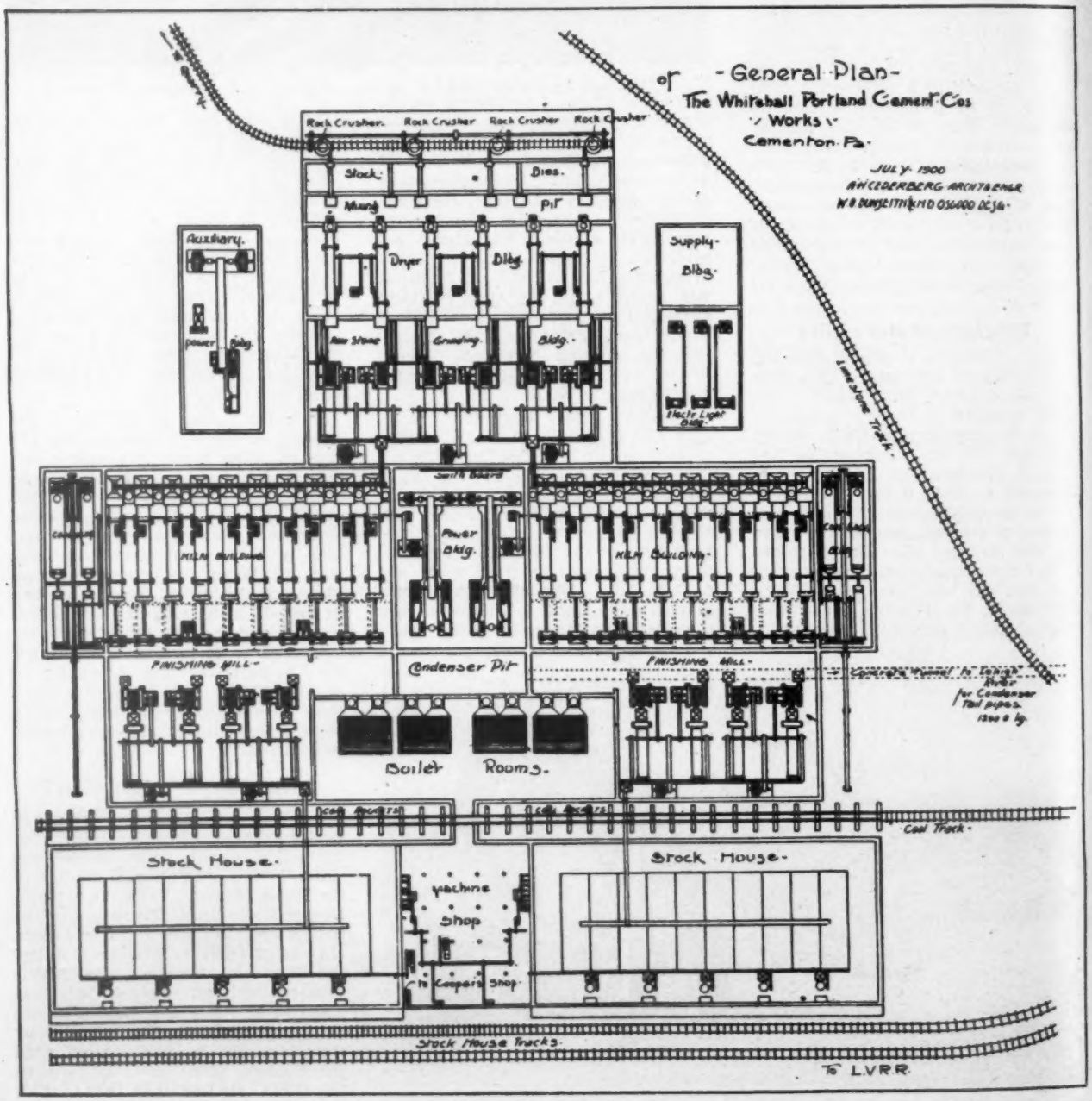
What Length Future Kilns?

The first cement plant engineer to install 8x150-ft. kilns of standard design—that is of boiler plate—was Aman Moore, who in 1906 engineered the Union Portland Cement Co. plant, Devil's Slide, Utah. These kilns were not housed, in spite of the northern climate. Two years later he installed the same size kilns for the Southwestern Portland Cement Co.'s first plant at El Paso, Tex. Aman Moore was an old timer in the industry by this time, for he had started with the Buckeye plant in Ohio early in the 1890's. He told us in 1932 that he also built the first plant to have kilns

longer than 150-ft., in 1911, for the Oregon Portland Cement Co., Oswego, Ore. These were 8x10x210 ft. He told us, too, in 1932, that any plant at that time having kilns less than 200 ft. was already obsolete, and that kilns up to 800 ft. long would be built in the future. He estimated that a kiln 11½x15x800 ft. would easily produce 6000 bbls. of clinker with a fuel consumption of 42.3 lbs. of 13,000 B.t.u. coal per bbl. of clinker.

We do now have kilns up to about 500 ft., and apparently it is true that the longer kilns have great capacity with more economical fuel consumption. But before we go to even greater lengths, it is our opinion that more study will be made of the real nature of the rotary kiln as a chemical machine for the production of portland cement clinker. It seems strange that this problem has not been more intelligently tackled before now, but it appears to be a fact that little attention was paid to finding out just how the chemical reaction between two or more solids actually takes place. The factors of time and exposure to heat are apparently quite as important as the temperature of the flame or hot gases in the kiln. Yet a study of the published descriptions of plants shows that scant attention was directed to the relationship of diameter and length, slope, and the period of rotation of the kiln. The early discussions of cement manufacture seldom if ever consider these vital factors in a critical way. The slope of most kilns appears to have been fixed at ½ in. per ft., regardless of dimensions. Speeds varied from 1½ r.p.m. to as slow as 1 revolution in 2½ min.

All this, not withstanding that from the very start in the use of rotary kilns, it was recognized as an extremely inefficient roasting or sintering device; because of necessity, apparently, so much useful heat had to be lost. Part of the lack of attention to making the process less wasteful has been due to the fact that the



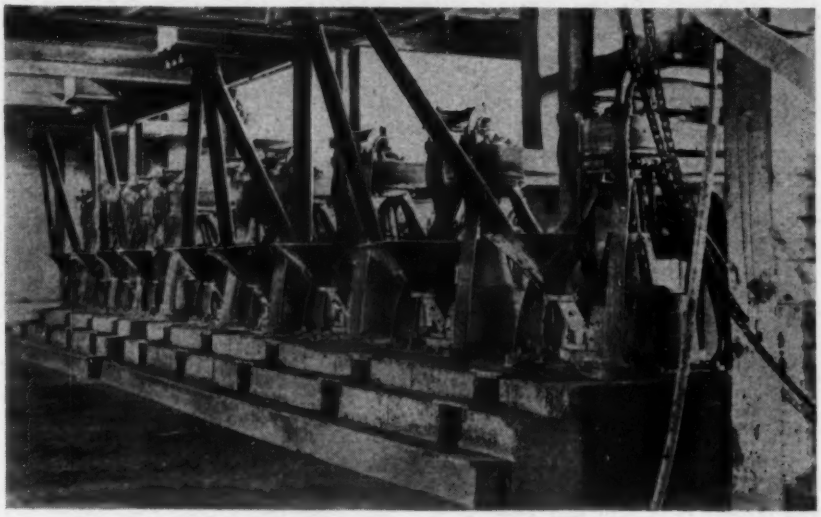
Layout of Whitehall Portland Cement Co. plant at Cementon, Penn., appearing in August, 1900 issue. Note how crushers are all driven from one line shaft

industry progressed in spurts in boom times when costs of operation were more or less secondary, and partly to the fact that coal in this country has always been relatively cheap. One could still make acceptable cement in 60-ft. kilns. But, according to present indications fuel economy in the future will be quite as important as labor and power economy. Long kilns are a factor, if not the only factor, but that may be only because the time factor for the chemical reaction is longer; and there are other ways of increasing the time factor.

Original American Pulverizers

Aman Moore in his illuminating letter of 1932 said the future cement plant would contain but five major pieces of equipment: (1) a primary crusher (2) a secondary crusher or pulverizer (3) a raw material mill; (4) an 800-ft. kiln; (5) a clinker mill. All were to be huge single units. Everything else would be auxiliary equipment, or trimmings. Fourteen years have passed since then and to all apparent indications the crushers and mills have reached, or, in the case of mills, have passed their maximum useful sizes. Other factors than mere capacity of individual machines have entered the picture. We will leave consideration of the primary crusher to the later article on quarrying, since quarry operation has been definitely conditioned by the size of the primary breaker available at any given period.

The first secondary crushers used in cement mills were of the rotary "coffee-mill" type, developed originally, we believe, for coal crushing. The fine grinding, both raw material and clinker, was done between mill stones, as ancient as the art of grinding. The first genuine American contribution to the art of grinding in the cement industry appears to have been the Griffin mill of the Bradley Pulverizer Co., the predecessor of the present Hercules and similar mills. As early as 1897 we find our journal editorially boasting that: "Europe is awakening to the fact that American skill and ingenuity is producing strictly first-class cement machinery on entirely new and original lines, and of the highest efficiency, introducing a new mechanical principle in pulverizing. We refer to the Griffin mill. This mill has invaded Europe upon its merits and is securing the highest commendation from old and conservative cement manufacturers in Germany and England, where it has been installed."



Battery of Griffin mills in early cement plant

That this machine was popular in this country is shown in plans of the early portland cement plants where they were installed in batteries of a score or more. A little later German ball and tube mills, mostly of Krupp manufacture, began to be used in this country, and the controversy began over the relative merits of tube-mill vs. Griffin mill grinding of cement clinker. The Griffin mill, of course, had the mechanical advantage that it was a self-contained unit, taking secondary crusher products, while a tube mill had to be preceded by a ball mill. In March, 1898, the Bradley Pulverizer Co. advertised that it had sold 60 Griffin mills in the previous 90 days. The Lehigh Portland Cement Co.'s first plant, placed in production at Ormrod, Penn., in 1899, had 24 Griffin mills for an output of 750 bbls. per day. All these early installations were belt-driven from line shafting, and a cement plant was certainly a noisy, dusty place.

The advantages of finer grinding both raw material and clinker were beginning to be recognized as early as 1900. In our March issue of that year was an article by Edward Duryee, Colton, Calif., on the causes of inferior portland cement, in which he said: "It appears to be pretty well established that the value of standard commercial portland cement is increased 25 percent by grinding to a fineness of 1 percent residue on a 100-mesh sieve and 50 per cent by grinding to a fineness of 3 percent residue on a 200-mesh sieve," as to raw materials he said: "Where the carbonate of lime is of crystalline character it is necessary to grind the raw mix very much finer than is the case with marls or chalks, to prevent the lime from remaining uncombined in the cement."

Nevertheless, American cement manufacturers as a whole remained loyal to the Griffin mill until at least

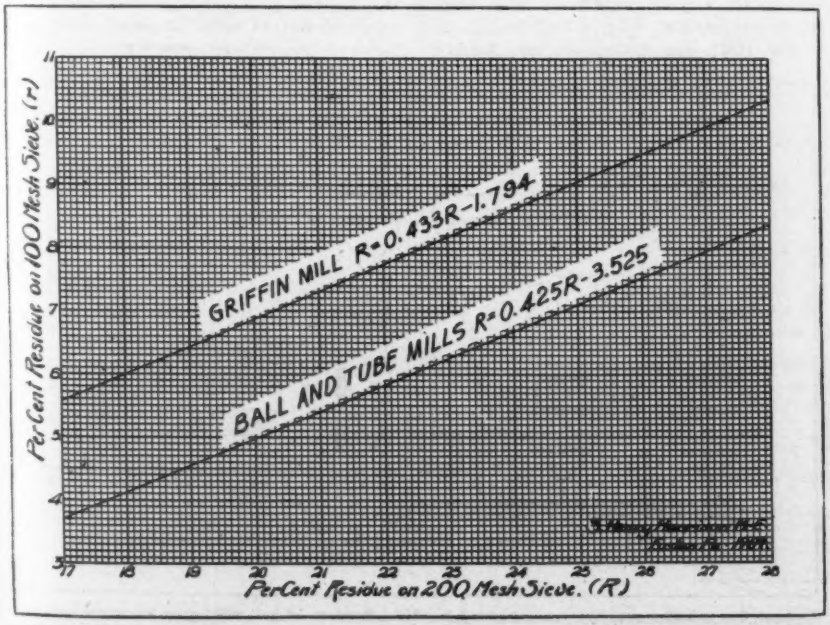
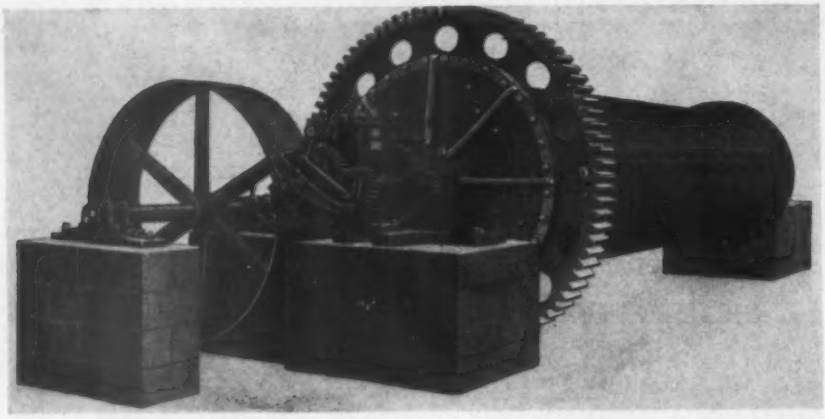


Chart (March, 1906) showing relative fineness achieved by two types of grinding equipment

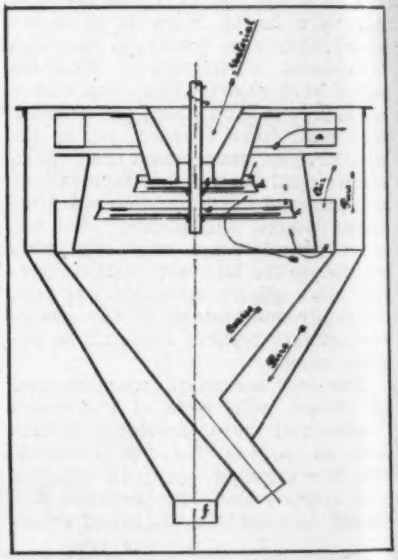


End view of early type tube mill for fine grinding

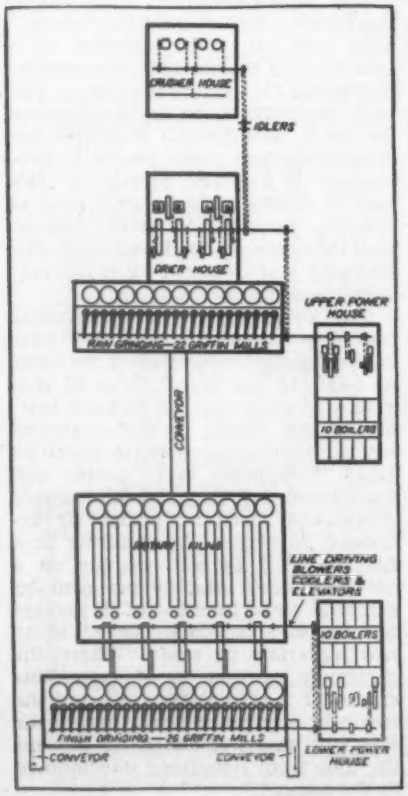
1906 or 1907, when tube mills came into general use. In most instances the Griffin type mill was kept as a preliminary grinder, but the newer plants installed ball mills, until the combined ball and tube mill, the compartment mill, appeared on the scene. The Griffin type mill, or ring-roll mill, however, was never out of the picture; and especially after it was redesigned primarily for a preliminary grinder, it came to be a very important piece of equipment in the most modern plants. It was defended as a finish grinder for clinker as late as March, 1906, when S. Henry Harrison, superintendent of the Vulcanite Portland Cement Co., gave the results of a year's work, comparing results of Griffin mills with tube mills. He concluded that the Griffin mills produced more "flour" than the tube mills.

The first mention we find of the Fuller-Lehigh mill is in an article by Richard K. Meade, in our May, 1906, issue, where he describes tests, at the Phoenix Cement Co. plant, in grinding clinker. At that time these mills had already been installed at the Alpha Portland Cement Co.'s plant for grinding coal. This mill became generally accepted for coal grinding, and in later years an improved version of it, now known as the Babcock & Wilcox (B. & W.) mill is extensively used for grinding raw materials, clinker and all kinds of mineral products. The Raymond mill and the swing-hammer type mills or pulverizers were introduced about the same time (1899). The Raymond air separator was a distinctly American invention, although the Germans had invented an air separator and used it in connection with a ball mill.

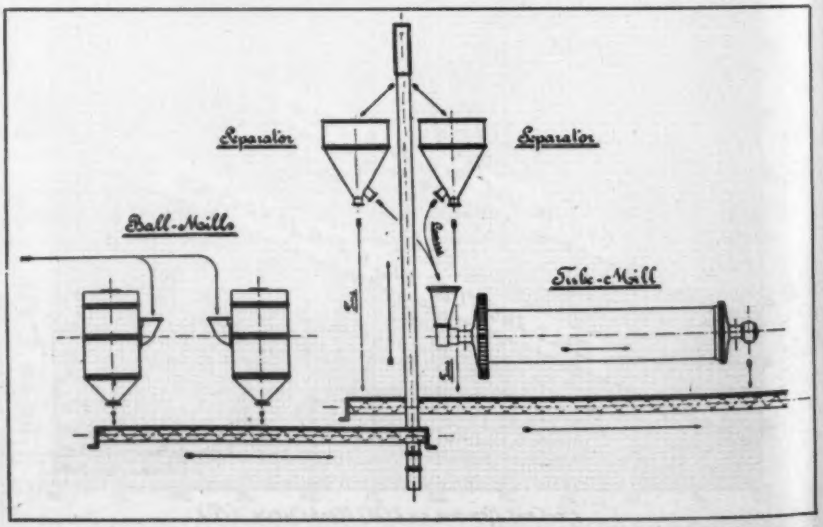
By 1901 our American machinery manufacturers had developed so much new cement plant equipment that a British delegation of five of the most prominent manufacturers came to the United States, and according to our August, 1901, issue returned to London "strong in the belief that only the prompt introduction of American machinery and processes can enable Great Britain to retain its present hold on the cement business. Wm. Harper, manager of the British Commercial Intelligence Bureau, said: "The Americans a short time ago adopted a secret process of manufacturing portland cement by means of rotary roasting kilns, which will drive England, France and Germany practically out of the field. By the aid of simpler and cheaper machinery the Yankees are able to make their article in 8 hours, which in England with its ancient, cumbersome



Cross-section of early (October, 1903) German air separator



Plan of original Dixie Portland Cement Co. plant (1908) showing line shaft drives at their best



Cement fine grinding practice recommended in 1903. Product of ball mills goes by screw conveyor and bucket elevator to two separators, the coarse particles from which pass to tube mill

equipment requires three or four weeks. The cost of the Yankee product is less than half that of the English." Before we leave this subject, let it be said that a firm of American engineers, Lathbury & Spackman, who we shall refer to again, designed and installed the first rotary cement kiln at the Aalborg Portland Cement Works in Denmark—the very home of the widely used Aalborg shaft kiln. We believe it was at this plant that F. L. Smidth & Co., Copenhagen, got its start in the cement and cement machinery business.

ENGINEERING TALENT in the Cement Industry

WE HAVE SAID that the early American portland cement industry was short on chemical talent, but it certainly was not short on engineering and inventive technical talent. Many mechanical and electrical engineers had parts in building up the industry—too many to begin to give credit to any considerable number. Some worked as engineers for cement companies, some as consulting and designing engineers, some were machinery manufacturers, and some were also promoters. Robert Leslie, in "His History of the Portland Cement Industry," paints the cement plant promoter as the Villain of the Times, but an unbiased review of the record will show that such engineering promoters as W. F. Cowham, Aman Moore, Chas. A. Matcham, and at least some others, were responsible for much of the pioneering necessary for technical progress. They were less conservative, as usual, than the old established manufacturers, who lived in constant fear that their plants would be rendered obsolete.

It is true, as Robert Leslie describes, that there were a lot of irresponsible promoters during the 1895-1905 period. The evidences are numerous in the files of our own journal, where marl lands in Michigan, northern Ohio and Indiana, were advertised as "portland cement land." Many of these early marl plants were casualties, and our own journal in editorials warned would-be investors to beware. The record of one of these marl promotions is fairly complete, and is typical of many that fell by the wayside, most frequently, according to our own journal, for want of adequate professional engineering advice.

In 1900 the Monolith Portland Cement Co., Ltd., was incorporated for $500,000 to build a plant at Bristol, Ind. (This company must not be confused with the present Monolith company in California.) A year later it was reported to have paid out, up to that time, $4000 for labor and supplies for the new plant. In June, 1902, a receiver was appointed, with assets in sight of less than $12,000. The promoters had promised stockholders a plant of 12,000 bbls. per day capacity, it died trying to build a 100-bbl. per day plant. In addition to stock, $150,000 in mortgage bonds had been sold, from the proceeds of which only $8,000 was in hand to distribute to the bond holders.

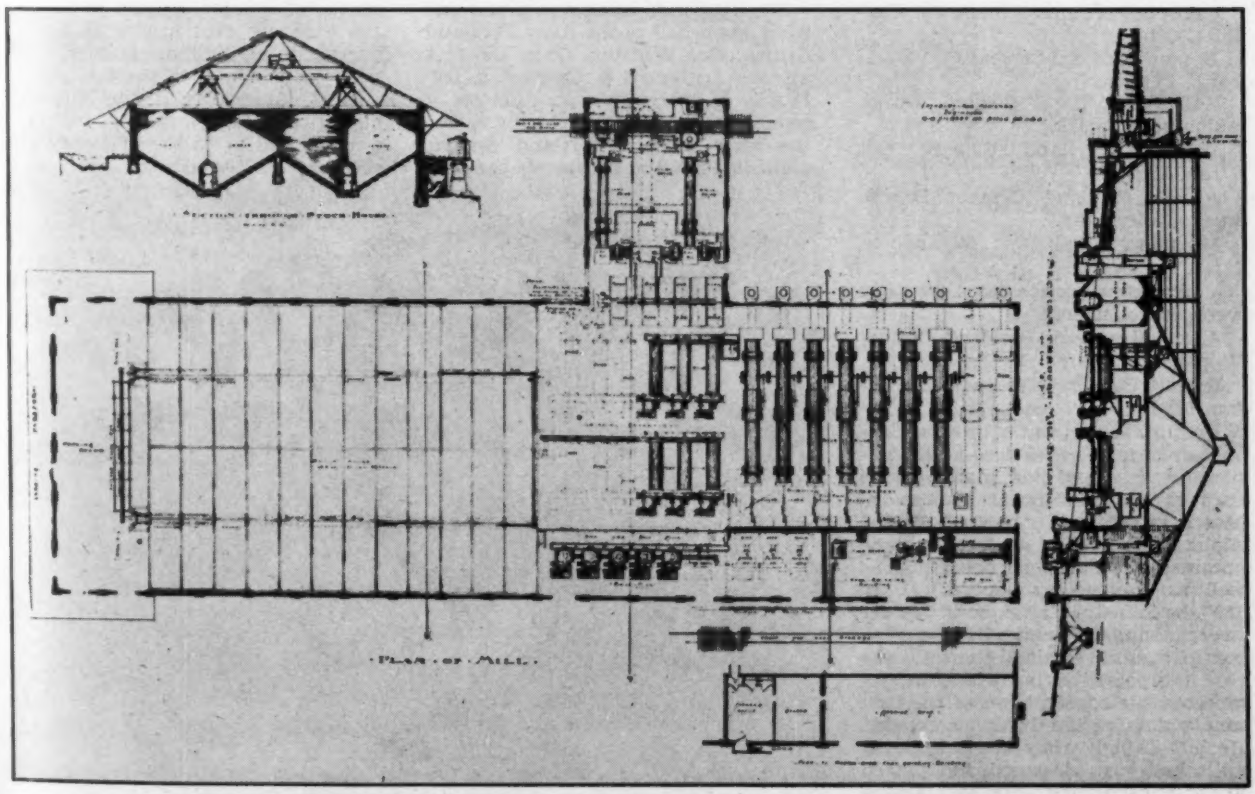
Most Active Engineers

By far the most active firm of consulting and designing engineers to specialize on the infant American portland cement industry were Lathbury & Spackman, Philadelphia. They designed some of the early shaft kiln plants, and, as we have recorded elsewhere, installed the first rotary kiln in Denmark, if not in all Europe. Their advertisement in our January, 1901, issue listed the following rotary-kiln plants as designed and supervised by them.

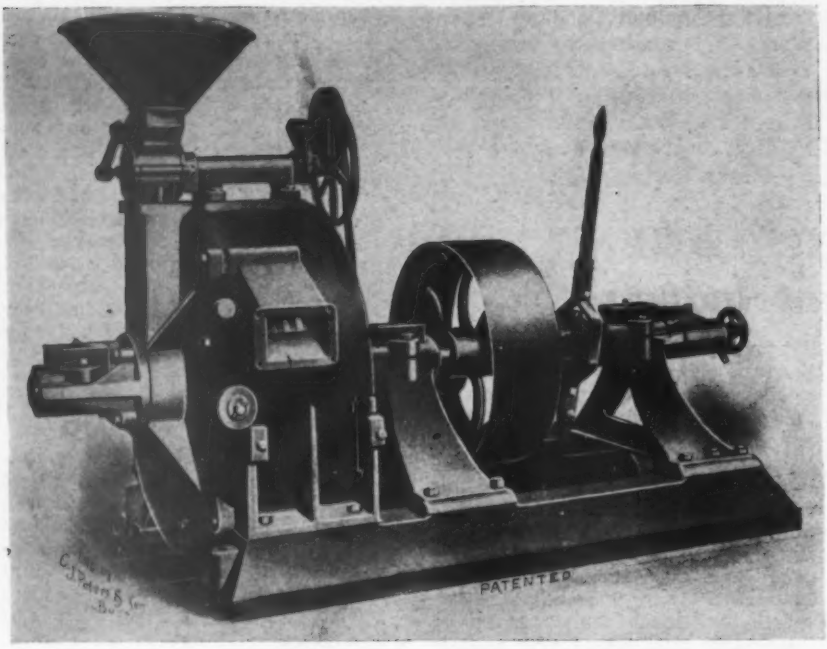
Alma Portland Cement Co., Wellston, Ohio.

Clinton Cement Co., Pittsburgh, Pa.

Lawrence Cement Co. of Pennsylvania, Siegfried, Pa.



Plan and elevation details (November, 1900) of Alsen Portland Cement Co. plant at West Camp, N. Y.



Emery mill for fine grinding which did a good job but had comparatively small capacity

American Cement Co., Egypt, Pa.

Portland Cement Co. of Utah, Salt Lake City, Utah.

Pembina Portland Cement Co., Milton, N. D.

Milburn Lime & Cement Co., Dunedin, New Zealand.

New Zealand Portland Cement Co., Auckland, N. Z.

Castalia Portland Cement Co., Castalia, Ohio.

Beaver Portland Cement Co., Marlbank, Canada.

Aalborg Portland Cement Works, Aalborg, Denmark.

Wabash Portland Cement Co., Stroh, Ind.

Alsen's Portland Cement Fabrik, Itzehoe, Germany.

Michigan Alkali Co., Wyandotte, Mich.

Under construction at that time were the following:

Alsen's American Portland Cement Works, West Camp, N. Y.

Detroit Portland Cement Co., Fenton, Mich.

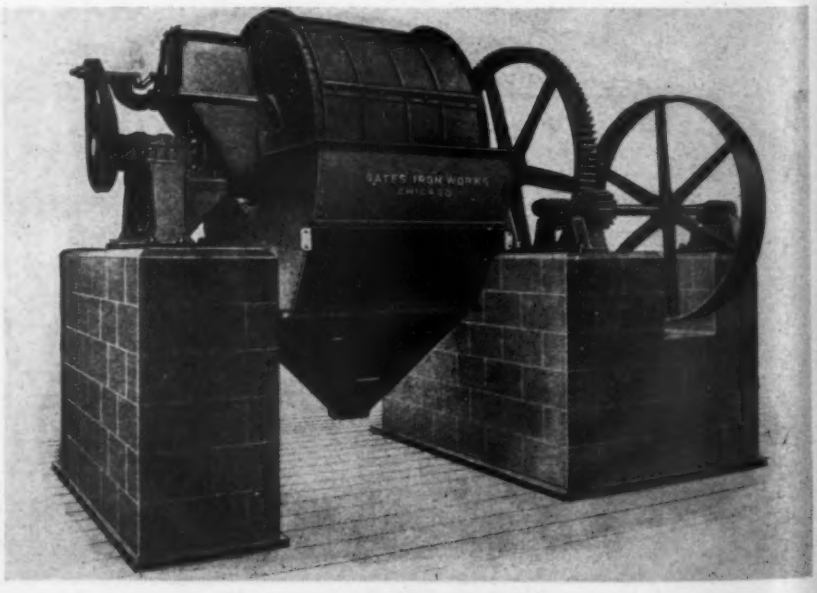
Another engineer, who was responsible for the design and engineering of several new plants at the turn of the century, was Chas. A. Matcham. Originally he was with the Alpha Portland Cement Co., where he obtained considerable operating as well as engineering experience. In 1897, he joined with Col. H. C. Trexler in organizing the Lehigh Portland Cement Co., and remained there for the next ten years, during which he engineered the construction of the first nine plants of the Lehigh company. He left Lehigh after two additional mills had been designed and placed under construction. He was also a machinery manufacturer, being associated with Col. J. W. Fuller, as president of the Fuller Engineering Co. Col. Fuller was general manager and H. G. Barnhurst, mechanical engineer. Both the latter left their marks on the technical development of portland cement machinery.

First Use of Electricity

We have been unable to determine what happened to the Alma Portland Cement Co., Wellston, Ohio, the first on the Lathbury & Spackman list. It was in successful operation for a number of years. Undoubtedly it was the most modern portland cement plant in 1899, and notable as the first to employ electric motor drives. Up to that time all the machinery in cement plants was driven by belts from line shafting. The line shafting was driven by Corliss horizontal compound steam engines in most cases. Presumably it was as a manufacturer of Corliss steam engines that the elements which were later to be combined into the Allis-Chalmers Manufacturing Co., first became acquainted with the portland cement industry, in which it later became so important a factor.

The story of this plant deserves a permanent place in the record of the industry, although it is scarcely mentioned in Robert Leslie's History. Following is an extract from our January, 1900, issue: "The power plant consists of four tubular boilers of 200-hp. each and two engines 350 and 250-hp., respectively. These engines are belted to two 250-kw. Eddy electric generators. The various machines throughout the plant are driven by Eddy and Westinghouse motors operated by main circuits run from the generators in the power house on 220-volt, direct current. The motors are distributed in the different departments and drive to either single machines or groups of two or more machines of the same class. Up until the time of the construction of this plant in 1898-99, the exclusive use of electric motors for driving all machinery had been favorably discussed by cement manufacturers and designing engineers, but the consensus of opinion seemed to be that the excessive dust arising in all departments of the manufacture would prove detrimental to the motors."

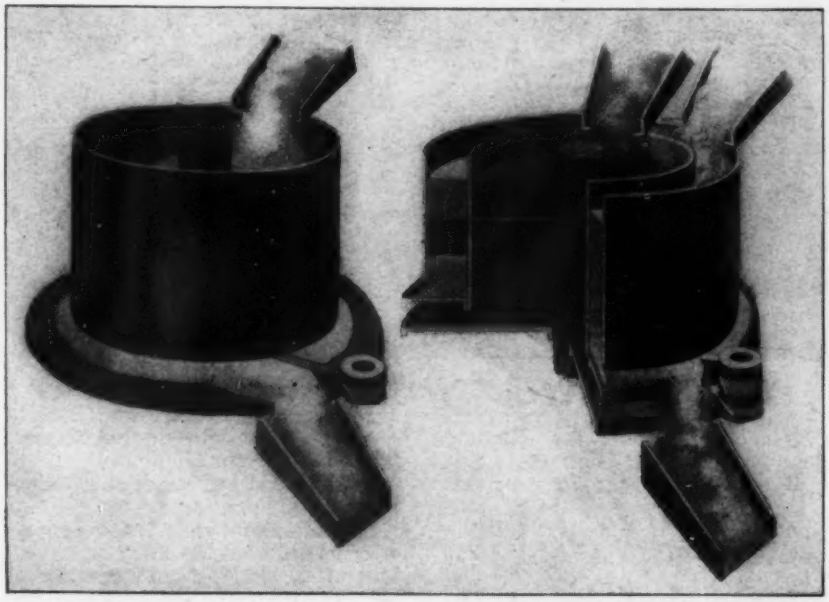
Most interesting is the following quotation: "Discouraging opinions were offered as to the efficiency and economy of the direct-current sys-



One of the early type ball mills brought out about 1921

tem operating under such conditions by both Westinghouse and General Electric companies. The alternating current system was offered as the most favorable, and one that would not possess the disadvantages of having commutators cut out by sharp cement dust. The principal owners of the plant, however, being coal mine operators and having successfully utilized the direct-current system with motors in their mines, authorized the engineers to adopt this system and proceed. The recommendations of the engineers for housing each motor in dust-proof portable casings were carried out in the first installation in the plant, but after operating successfully for two months, the housings around each motor were found unnecessary and were removed, as the dust appeared to have the effect of polishing the commutators, and on starting up the motors, the high speed of the shaft was found to act as a fan in expelling the dust from around the coils in the machine.

"The installation, which was experimental from its inception, became a positive success from the start and much valuable data have been secured on the efficiency and economy over the use of shafting for transmission of power under conditions existing in a portland cement plant." This original Alma plant was burned down in November, 1901, from what cause the record does not show, but possibly caused by defective wiring. It was immediately rebuilt. Anyhow, the engineers, Lathbury & Spackman, developed the same kind of a power system for the Detroit Portland Cement Co. and apparently used it in subsequent plants, including the Alsen's plant in New York state. The 220-volt direct current continued to be used for some years, in spite of the high transmission losses; for cement-mill loads were heavy and hard to start and satisfactory alternating current induction motors were not developed at that time.

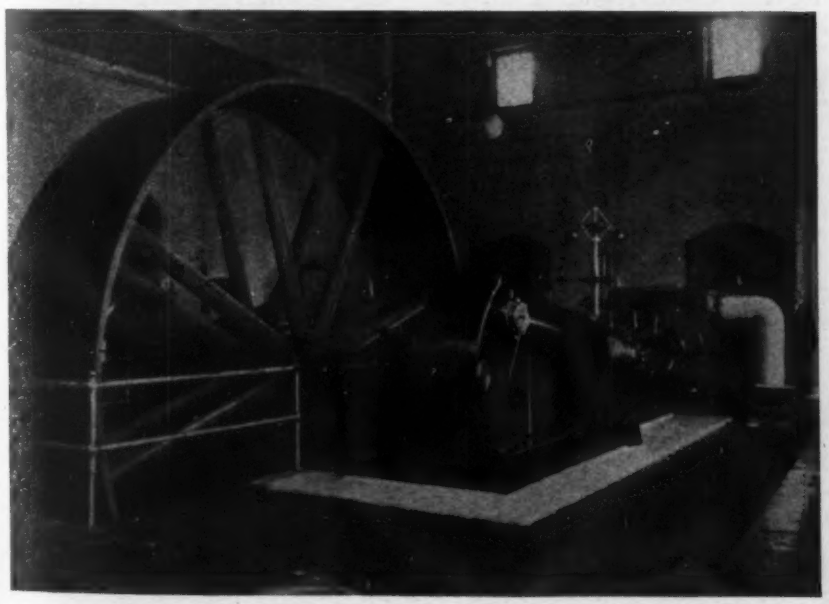


Early examples of measuring and proportioning equipment (1908) devised for cement manufacture by the late E. N. Trump, then chief engineer of Solvay Process Co. To the left, measuring one material; to the right, proportioning two materials

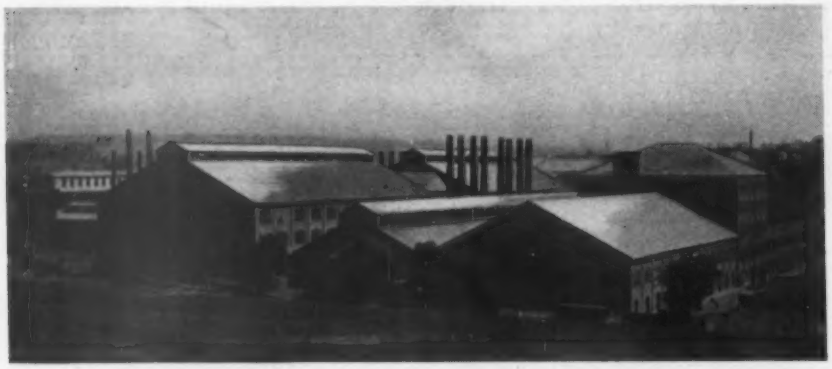
Modern Plant of 1900

To give the reader a picture of a really modern plant of the 1900 model, herewith is a description, published in August, 1900, of the recently completed plant of the Whitehall Portland Cement Co., Cementon, Pa. —all the more interesting because this plant, after 46 years, is still in service, without, so far as we know, any very radical changes: First was a crusher building with four No. 4 McCully gyratory crushers fed by a cable tramway from the quarry. All four crushers were driven from a line shaft by a direct-current electric motor. Second, there was a dryer building containing six rotary dryers, driven in pairs from line shafting by individual electric motors (one for each pair of dryers). The dryers were fed by an elevator and through a charging scale. Third, the raw-grinding department consisted of six "Krupp batteries," each having a No. 8 ball mill and a 22-ft. tube mill. These batteries were divided into three sets, each set driven by an individual electric motor through line shafting. Fourth, two kiln departments, in each 10 rotary kilns 6x45 ft. each kiln with a Reeves variable-speed drive. Fifth, two finish mill departments, each with four "Krupp batteries," of the same size and character of drive as in the raw grinding department. Sixth, two stock houses with ten bins each to carry between 3000 and 4000 bbls. Each bin had its own elevator and packer. Seventh, a machine and cooperage shop. Eighth, a boiler house with four Stirling boilers of 500 hp. each. Ninth, a power house with four electric generators divided into pairs, each pair driven by a Corliss cross-compound engine. Tenth, an auxiliary power plant, with a Greene steam engine and a single set of generators. Eleven, an electric-lighting-power plant equipped with three Westinghouse automatic engines, each driving a Lundell patented electric generator.

The Whitehall plant was designed and built by A. Hugo Cederberg, of



Power plant (1899) at Ormrod, Penn., plant of Lehigh Portland Cement Co., had 500 h.p. compound condensing engine



Whitehall Portland Cement Co. plant at Cementon, Penn., in 1900

Catasauqua, Pa., and the following manufacturers and contractors furnished machinery and construction:

Krupps, Germany, grinding machinery.

R. McCully, Philadelphia, Pa., crushers.

Keystone Electric Co., Erie, Pa., electrical equipment.

Vulcan Iron Works, Wilkes Barre, Pa., dryers, kilns and steam engines.

Stirling Boiler Co., Chicago, Ill., boilers.

Groton Bridge & Manufacturing Co., Groton, N. Y., structural iron.

Emanuel & Son, Catasauqua, Pa., construction work.

W. N. Thayer, New York City, electric lighting plant.

Rawson & Morrison Mfg. Co., Boston, Mass., cable tramway.

B. F. Sturtevant Co., Boston, Mass., pulverized coal apparatus.

J. B. and J. M. Cornell, New York City, structural iron, fans, etc.

Wm. F. Mosser & Son, Allentown, Pa., conveyors, etc.

Chicago Belting Co., Chicago, Ill., belting.

Jeffrey Manufacturing Co., Columbus, Ohio, elevators.

Hull Clutch Co., Cleveland, Ohio, journals, pulleys, etc.

Into the plant went 27,000 cu. yd. of concrete, 4,000,000 brick and 1000 tons of structural iron. Mr. Cederberg, the designing engineer, said in his article describing the plant, that it was "constructed of good substantial brick and iron buildings, making them practically fire-proof, and what is more important, dust-proof, if compared with some of the mills now in existence."

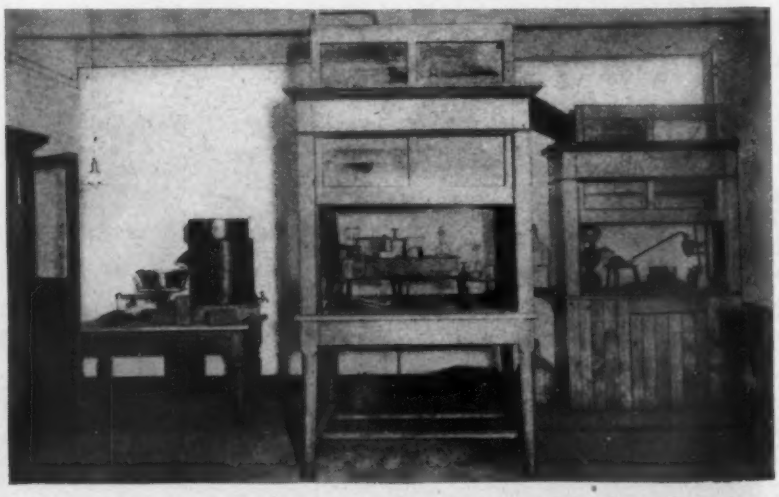
How Early Plants Looked

The preceding quotation reminds the writer that in his first week or two as editor of ROCK PRODUCTS, in 1917, a tiny 6-pt. news item got into print to the effect that the Security Cement and Lime Co., Hagerstown, Md., "was building a brick addition to its stock house." Sometime later he was not a little chagrined to receive a friendly letter from Loring A. Cover, president of the company, saying that several friends in the cement industry had seen the item and had offered to supply the Security company with portland cement for building this stockhouse, if that company was unable to make some! Good-natured kidding all around, but the editor did not know then that some early cement plants actually were built of clay brick.

There is nothing in the record to show that the early portland cement manufacturers were embarrassed by the inconsistency shown in erecting ramshackle plants for making cement, but we are glad that our predecessor as editor did see it and protested in an editorial in the May, 1900, issue under the caption "Concrete Construction for Cement Mills," an extract of which read: "The time has come when the American portland cement producer should give more encouragement to concrete construction in and about his own plant, and thereby demonstrate absolute confidence in his own product. As long as he continues new works of wood, stone, brick, and structural steel, while he advocates concrete to others for like purposes, his position is illogical. It would be better to practice what he preaches by abandoning old materials of construction, and thereby bring his conduct closer in line with his present and future business interests. . . . The American mills, with few exceptions, have done little to promote the use of concrete building construction in connection with their own works. This is a great fault. Every new cement plant should be constructed, as far as possible, of concrete, while owners of old mills should see to it that all future extensions be made with concrete."

It took about 20 years for this suggestion to soak in, and then probably only because Carl Leonardt, of the





Above: One of the earliest cement testing laboratories, Philadelphia Public Works. Richard L. Humphreys, testing engineer

Left: Over 20,000 briquettes already broken before 1900

Southwestern Portland Cement Co., so kidded his fellow producers and showed by example in his Victorville, Calif., plant that it could be done. However, the cement manufacturers should not be blamed too much because the industry was in a constant state of flux and too permanent machinery installations, or buildings to house them, would have proved a handicap. Indeed, it has proved a handicap to those enterprising manufacturers who followed Carl Leonardt's example and precept. When kilns have to be lengthened, and unanticipated new equipment installed, concrete construction has often been too permanently fabricated.

It is strange, though, that even so obvious an improvement in stock houses as the reinforced concrete cylindrical silo had to be developed and tried out first by the grain elevator industry. This was the first radical change in the design of portland cement plants. The development of plant design, down to the modern plant will not be discussed here because the subject was quite fully covered by the present writer in ROCK PRODUCTS, August, 1944. In the new plants to be built in the post-war period we do not look for radical changes in the fundamentals, which have been more or less standard since 1900. There will, doubtless, be many refinements in all departments to control quality, dust, fuel economy, etc., with particular emphasis on just what function the rotary kiln does actually perform in the manufacture of portland cement.

It is not impossible that when more is known about the chemical reaction, we shall have catalysts to aid the formation of the complicated silicates which exist only temporarily in cement.



One of the first cement bag cleaners of German make

John Prince Recalls a Waste-Heat Power Plant of the 1900's

Dear Rocky: I see by your letter of April 24th that my dark past has come to light when you examined the *Sibley Journal of Engineering* of Cornell University for March 1904. This contained an article by Prof. R. C. Carpenter concerning tests made at the Cuyaga Portland Cement Co. plant where waste-heat boilers had been installed.

For about ten years following my graduation from Cornell in 1899, I was connected with the cement industry. These connections included either or both engineering and supervision, and included about half a dozen plants. I believe the original waste-heat boiler installation was developed by Professor Carpenter and was applied in several of the plants with which I was connected. Of course, many problems developed and many modifications were made in later years. Water-tube boilers of various types were used but the accumulation of dust on the tubes continued to be a serious difficulty.

The Glenn Falls Portland Cement Co., Glenn Falls, N. Y., was my first job after leaving school. There I was first, assistant superintendent, and later superintendent. Fortunately for me, perhaps, that plant was destroyed by fire while I was still there and I had much to do with the design and reconstruction of the plant.

About the beginning of this century rotary kilns began to be introduced in the industry. The first one I ever saw was I think 5 ft. diameter by 60 ft. long. At that time the Glenn Falls plant included ten vertical kilns for the production of clinker. In order to operate these, the raw material after being ground was made into bricks, and loaded on cars by hand, run through dryers, elevated to the fourth floor of the kiln building, and passed down into the kiln by hand. On the third floor coal was shovelled into the kiln by hand, and on the second floor men poked down the clinker as it was being burned, using long iron bars. On the ground floor, bars at the bottom of the kiln were worked back and forth by hand to let the burned clinker onto the floor where it was hand sorted. The under-burned clinker was returned to the kiln.

As I recall the plant now these ten kilns then had a capacity of about 900 bbls. a day, and I have no doubt more labor was employed than is now used in any 5,000-bbl. plant.

Soon after I became assistant superintendent I recall the first strike I ever encountered. I believe at that time the men were getting $1.25 a day for a 12-hr. shift; that seemed



John Prince

to be the going rate. The strike obtained for them an increase in this rate to $1.50 a day. The plant was operated on two 12-hr. shifts with a double shift at the end of the week in order to rotate the men from one shift to the other.

In those days the production of portland cement was a "secret" process, the mixing scales of the plant were in code and only the president of the company determined the mixtures. Three brands of cement were produced, one being straight portland cement, the second contained 50 per cent raw material reground into the finished cement, and the third contained only 25 percent portland cement, the balance being raw material. Of course there were no adequate specifications, as the principal competition was imported cement, but the usual measure of value was the tensile strength of neat portland cement briquettes, and it was amazing how nearly the blended cement came to attaining the strength of portland cement.

JOHN PRINCE

Kansas City, Apr. 26, 1946.

Moves Office

THE PHOSPHATE MINING CO., acquired during 1945 by the Virginia-Carolina Chemical Corporation, has announced that its office at 110 Williams street, New York, N. Y., has been closed and the company and its personnel have been transferred to the home office of the parent company in the Richmond Trust building, Richmond, Va.

QUARRYING
Conditioned by Size of Crusher

IF THERE IS any one factor in the development of the quarrying and crushed stone industry that outweighs all others it is the progressive increase in size of large crushers. The Blake jaw crusher was invented long before 1896 when the history of our journal ROCK PRODUCTS began. The McCully gyratory crusher was also in existence and was widely used. But both types of crushers were designed to take man-sized rock—that is pieces of rock no larger than a man could lift into a horse-drawn cart, or a small narrow-gauge railway car.

Drilling and blasting was on the same scale. The tripod steam drill and black powder were the tools commonly employed in getting the stone out of the ledges. Dynamite also was beginning to be used, and powder makers were already studying methods and processes to make it a safer commercial explosive. About 1896 compressed air was being substituted for steam in percussion type drills, and various types of compressed air drills were in the works. The science of drilling and blasting for large scale operations had not been developed.

The quarrying industry, aside from getting out dimension stone, had its beginning in the production of crushed stone for railway ballast and for macadam type roads. In 1896, when the concrete industry was beginning to bloom, crushed stone was the preferred aggregate, both fine and coarse. Crusher run material was specified or preferred. To meet this demand the two largest crushed stone operations in the Chicago metropolitan territory—Dolese & Shepard Co. and Brownell Improvement Co. were already going strong, and were advertisers in some of the earliest issues of our journal.

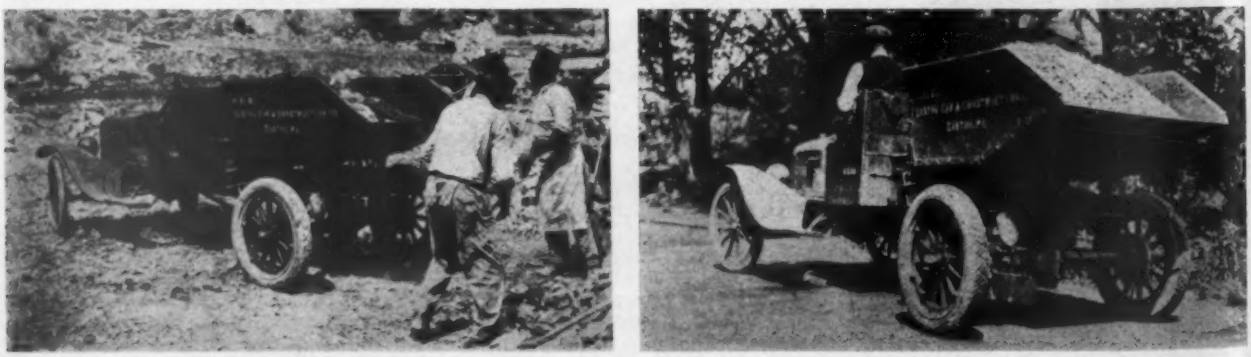
In our January, 1901, issue was an editorial on "Crushed Stone," which shows the enthusiasm of our original editor; it read in part: "The rapid increase in the use of portland cement throughout the country is building up the crushed stone industry, which is now far behind legitimate demand. There should be crushed stone plants in the neighborhood of every town of 3000 population or more in the country, especially on the lines of railways, which use great quantities of this material. It would likewise further the interest of local authorities by supplying material for construction of macadam roads and village streets, especially where gravel is scarce. The use of crushed stone for sidewalks and concrete masonry is more economical than sand alone, since the proportions call for less cement in the mixture. Cement sidewalk contractors would likewise become good customers. The large cities are usually well supplied with crushed stone. The opportunities in the smaller cities should be looked into and plants established, as remunerative returns, under fair management, can be assured on the capital invested."

However, it was easier for the editor to recommend than for novices to get into the business, for in ROCK PRODUCTS, September, 1903, O. H. Duerr, Buffalo, N. Y., complains that "there are no reliable data available on production of crushed stone. The only data available are furnished by suppliers of machinery and these are often misleading." He set out with a plant to cost $15,000 for a capacity of 750 tons per day. The plant actually cost $25,000. Instead of running 10 hours a day as he had planned, his plant averaged only 6½ hours a day during its first year because of breakdowns, etc. The expense of maintenance on this plant the first year was about $8000. During the off season Mr. Duerr reconstructed the plant at a cost of an additional $7000, making its construction cost at the beginning of the second season $32,000. However, the improvements reduced his maintenance and repair costs the second year to $4000, and he was able to increase his output 85 percent over the first year's operation.

We suspect that this was a very typical case, but numerous new crushed stone companies got their start during the first decade of the present century. The news items in ROCK PRODUCTS are proof of that. The early ROCK PRODUCTS took great interest in all branches of the quarry industry and contained descriptions of slate, dimension stone, and monument stone-cutting plants. It did not become exclusively a crushed stone part of the industry journal until 1917. A monument trade journal was an offshoot of the original ROCK PRODUCTS, and it was this monument journal that Fred K. Irvine, the former editor of ROCK PRODUCTS continued to edit and publish after 1917.

Big-Hole Quarrying

Just when the first large-hole or well-drill hole, method of blasting was introduced is not available from the record. It was really a revolutionary step, but it does not seem to have been appreciated as such at the time. The first advertisement of a well drill was in the August, 1902, issue of our journal—that of the Keystone Driller Co., Beaver Falls, Penn. The advertisement says it is used for "soundings for bridge piers, prospecting for iron ore, testing placer grounds, drilling blast holes for deep railroad cuts ahead of steam shovels, etc." Nothing was said about its possible use in quarry blasting.



Early type truck haulage unit with dump body. To the left: Loading truck by hand; to the right, hauling crushed stone to destination

The reason for this oversight is easily understood, for well-drill blasting necessarily resulted in large fragments, and while there were steam shovels capable of handling these large chunks in excavating railway cuts, there was no rock crusher in existence which could handle them. It remained for Thos. A. Edison to solve this problem when in 1902 he decided to build a portland cement plant, to outshine all previous cement plants. He realized that there must be volume production all the way through. His 8 x 150-ft. kilns were more than twice the length of any then in existence and are referred to in the article on cement, elsewhere in this issue.

Edison wanted to use 90-ton steam shovels to quarry his rock and to do that he had to have a crusher that could handle steam-shovel sized stone. His solution was the invention of the famous Edison slugger rolls. The shovels loaded 5-ton skips which were placed on flat cars. After hauling these a mile the cars were pulled up an incline, three cars at a time. The skips were lifted off by a hoist and dumped into a primary breaker made of giant toothed rolls 5 ft. in diameter by 5 ft. long. The rolls weighed approximately 25 tons each. They took pieces of stone weighing up to 5 tons, at 190 r.p.m. and required 140 hp. All the secondary crushing and some of the pulverizing was done by three pairs of 36-in. rolls below the primary crusher, one below the other. The last pair of rolls was closed-circuited with a ½-in. mesh gravity screen.

The Edison rolls were apparently satisfactory, but they must have been costly and probably their capacity was far greater than most plants could justify. So far as we know but one crushed stone producer adopted them — the Tompkins Cove Stone Co.'s original plant at Tompkins Cove, N. Y., was equipped with them, and it is believed they are, or were until recently, still in operation there. They were made, we believe, by the Allis-Chalmers Manufacturing Co. This type of crusher was described in CEMENT AND ENGINEERING NEWS, in



Dumping into crusher with one of the first truck haulage units used in a quarry



Quarry of Lehigh Portland Cement Co., Ormrod, Penn. Photo taken about 1899

1911, after the Edison Portland Cement Co. had acquired very complete data on power consumption, lost time, etc. They had actually handled pieces of stone weighing up to 10 tons.

The first mention we find of well drills being used in a stone quarry is in an article by Ellis Soper in 1914, describing the operation of the Gager Lime and Manufacturing Co., near Chattanooga, Tenn. He says "one of the first 'well drills' for quarry work was installed here and is operating on a 100-ft. face. It has decreased the explosives cost of blasting by 25 percent." It was a Cyclone. In December, 1914 a news item states that the Columbia Quarry Co., St. Louis, Mo., had installed two Cyclone well drills in its quarry at Krause, Ill. Evidently the Edison Portland Cement Co. continued to use percussion drills, even though it could have handled well-drill blasted stone. However this very probably was because the difference in grades of limestone quarried required that the quarry be operated in benches.

The story of how larger and larger gyratory and jaw crushers were designed and developed to meet this change in quarry practice is told elsewhere in this issue by an engineer who had a most prominent place in their design.

The National Association

The editor of ROCK PRODUCTS started agitation for a national quarry owners' association as early as 1903. An organization was attempted soon after, and several successive attempts followed, but these associations included dimension stone quarry owners as well as crushed stone producers, and they had little in common interests. It was not until 1918 that the first group of exclusively crushed stone producers met in Chicago at the invitation of ROCK PRODUCTS' new editor to organize the National Crushed Stone Association. The editor of ROCK PRODUCTS was elected temporary secretary. Three years later the editor, with the assistance of seven manufacturers of quarry equipment and explosives, helped organize the Manufacturers' Division of the National Crushed Stone Association and the following year the first annual exhibit of equipment was held in connection with the association convention. The editor of this journal was secretary and manager of exhibits until 1925, when his duties were taken over by the secretary of the parent organization. For two years in succession, ROCK PRODUCTS published special convention report issues, which contained the complete transactions of the annual conventions—the programs for which had been worked out by the editor. After that he was relieved of this job, too.

Motor Truck Transportation

Two other developments in quarry practice stand out as marking distinct advances. One was the substitution of caterpillar or crawler treads for steam and other power shovels. For a few years many quarry operators who were using railroad type shovels continued to replace the railway-wheel trucks with crawler treads, but in the meantime other types of shovels especially designed for quarry and gravel pit work were developed—the full revolving shovel, which eliminated the necessity of a

cranesman to operate the shovel dipper.

After the necessity of laying tracks for the shovel was removed it was only a matter of time before quarry operators started to think about getting rid of tracks for locomotives and cars in quarries. So, in 1925, one of the prime experimenters in the crushed stone business, John Odenbach, president of the Dolomite Products Co., Rochester, N. Y., started using motor trucks to haul stone from the shovels to the crushing plant. They were the standard end-dump truck of that period with solid rubber tires, and the bodies were especially strengthened in the quarry company's own shop. The General Crushed Stone Co. started using trucks about the same time.

It was a considerable time after motor trucks were put on pneumatic tires before quarry operators were satisfied that a tire tough enough to stand up had been developed. Since then, like nearly every other kind of equipment used in construction work and quarrying, the size of trucks and pay loads has steadily increased, and we probably have not yet seen the limit in semi-trailer truck combinations for this purpose. Nevertheless the industrial railway method of plant haulage has never been abandoned, and probably never will be, for there is an economic limit to the length of truck haulage, and this economic length may be shortened by increased wages for truck drivers and increased gasoline prices.

The Author

• RAY C. NEWHOUSE is undoubtedly one of the most widely known engineers in the quarry and cement industries. His experience has covered all the angles — construction engineer, operating manager, machinery salesman, and designing engineer for both standard and special machinery for these industries. He recently retired as chief engineer and later manager of the cement and mining machinery department of the Allis-Chalmers Mfg. Co.

Early Experiences in Crushed Stone and Cement Business

By RAY C. NEWHOUSE

I AM GLAD to be able to contribute some of my reminiscences for the Fiftieth Anniversary number of ROCK PRODUCTS.

It happens that the first number of ROCK PRODUCTS was issued in the same year that I was first connected with the use of portland cement on important work. In June, 1896, I was sent to Massachusetts by the Columbus Construction Co. in connection with a contract for six sections (seven miles) of the Nashua Aqueduct, which was being constructed to connect the Nashua River with the original Sudbury water system for the Boston Metropolitan District.



Ray C. Newhouse, a pioneer in the development of crushers

Prior to the decision to use this new water-supply source, consideration was given to making a connection with Winnepesaukee Lake, the largest lake in New Hampshire, thereby avoiding the expense of a large dam on the Nashua River. However, an investigation of the watershed of this lake showed that it would be drained in two years, with normal rainfall.

The most striking point about this aqueduct (today) was the specification for the cement. The invert and side walls up to 10 in. above the spring line of the arch were built with natural cement, lined with one row of brick. The arch was made with portland cement, the original specification for which stated that "only an approved *imported* (italicizing mine) portland cement may be used on this work." During the first year only a small part of the arch was constructed, but imported portland cement was used on all of this except two short trial sections where American portland cement was used.

One brand of American portland was used on one section and another brand on the other section. One brand resisted the New England winter successfully while the other failed. Both of these brands had established good reputations for many years. It may be of interest that Robert W. Lesley, who later contributed so much to the history of the American portland cement industry, represented the cement company which furnished all portland cement used during the second and last year on this job.

I drove along the line of this aqueduct in 1928 when it presented the appearance of being as durable as the pyramid of Cheops. In this connection it may be of interest to note that the first man-made structure surpassing the pyramid of Cheops in magnitude was Boulder Dam which was not built in Boulder Canyon and was originally called Hoover Dam. There already was a Roosevelt Dam built on Salt River near Phoenix, Ariz., named after Theodore Roosevelt. Due to the Roosevelt Dam's location, so distant from any cement plant, a plant was built for the manufacture of the cement and the original Allis-Chalmers Co. furnished the principal machinery for this cement plant. The building of a cement plant for Boulder Dam was also considered but, based on estimates furnished by Allis-Chalmers for the cost of such a plant, it was decided by the government that it was not justified in building a cement plant, based on the limited market for portland cement after the dam was constructed.

No Market for Small Stone Sizes

While it may seem incredible to the young man in the crushed stone industry today, there was difficulty in 1896 in finding a market for fine crushed stone. The Casparis Stone Co., under the same management as the Columbus Construction Co., was furnishing flux for the Illinois Steel Co. and ballast for the Pennsylvania Lines around Logansport, Ind. The specifications for both the flux and the ballast required that the minus ⅞-in. material be screened out. This material was sold to the railroad company for station platforms at a price of $1.00 a carload. Even at that price the superintendent of the Logansport division complained that he was getting more screenings than he needed.

After nearly two years in New England, I returned to the main office of the associated companies as assistant to the president, S. Casparis, where I looked after equipment for

the various quarries and contracts. In 1898 a No. 8 Style D Gates crusher was installed at Marble Cliff, Ohio, that being the largest size gyratory crusher manufactured. By that time there was a slightly increased demand for small crushed stone. To take care of this, only one No. 4 Style D Gates crusher was installed.

In the fall of 1901 I went again to Massachusetts on the Boston Metropolitan Water System in charge of the excavation and lining of a tunnel approximately 5700 ft. long and approximately 1500 ft. of cut and cover work in the Town of Weston. The latter had the brick lining for the invert and side walls, but the tunnel was lined throughout with portland cement concrete. Of course, by this time there was no question about American portland cement. On this job electric locomotives were used for hauling excavated material from the tunnel and the mixed concrete into the tunnel, this being one of the first if not the first job where they were so used, although they had been used previously for hauling coal from mines. Horses and mules were used to haul the excavated material from the heading to a side track where it was connected to the locomotives.

While one of the early, box-type concrete mixers was used on one of the adjoining cut-and-cover sections, hand mixing was specified for this tunnel. The crushed stone was spread to an even thickness of 3 in. on the mixing board. The sand was also evenly spread on the board adjoining the stone and the cement evenly spread over the sand. This mortar mixture was first turned over twice dry and three times wet as the water was added. The mortar was then spread very evenly over the stone and the final mixture turned over three times with hand shovels. There was no definite specification for slump, but the water ratio had to be such that the cement would not leak out through the forms and that moisture would appear on the surface when thoroughly tamped.

I returned to the main office in Columbus, Ohio, at the end of 1903, where I made several investigations for Mr. Casparis, and during the summer and fall of 1904 erected a No. 9 crushing plant for him at Fairmount, Ill., this still being the largest gyratory crusher manufactured. This plant was erected to furnish additional flux to the Illinois Steel Co. By this time a use was found for a part but not all of the screenings by the Universal Portland Cement Co. at Buffington, Ind.

Into the Machinery Business

I had decided by the end of 1904 that I wished to become associated with the company which built these crushers, and I made application for a position with the old Allis-Chalmers Co., meeting H. Schifflin, manager of the Crushing Department, later manager, Crushing, Cement and Mining Machinery Department. He apparently thought that with my operating experience I ought to be able to sell machinery, and in 1910 he decided that I was capable of designing machinery. It is probable that it is largely due to that decision on his part that I, concurrently with ROCK PRODUCTS, have devoted fifty years of my life to that industry.

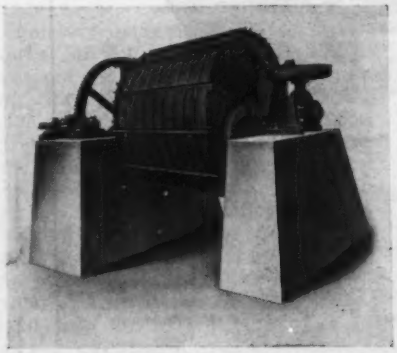
I became connected with the rock products industry when a No. 8 was the largest gyratory crusher manufactured. This was followed by the No. 9, about five years later, and the No. 10 four years later in 1905. Larger gyratories up to 60 in. radial receiving opening have been successfully built, the largest and heaviest to date having been built by Allis-Chalmers, two in 1926 for a large copper mine in South America, followed later by two of the same size for a nitrate mine. These four largest crushers were manufactured in Milwaukee, but they were all shipped to one country in South America, and that is Chile. It is probable that in the future larger and heavier gyratories will be built for crushing the taconite ores of Minnesota and for crushing the strippings of Pennsylvania coal mines so that they can be handled on a belt conveyor.

When I entered the employ of Allis-Chalmers in 1905 the standard grinding mills for a cement plant were No. 8 ball mills requiring 50 hp. to drive them, and 5-by 22-ft. flint pebble tube mills, requiring 75 hp. Since that time many grinding mills have been installed requiring more than 1000 hp. for the drive. However, it is probable that this trend will not continue toward still larger mills because of the lack of flexibility and the difficulty of dissipating the heat in very large grinding units.

How the Kominuter Got Its Name

ONE OF THE VERY FIRST cement machinery manufacturers to use the advertising pages of CEMENT AND ENGINEERING NEWS (forerunner of ROCK PRODUCTS) was F. L. Smidth & Co., who established an office in New York City about the same time our journal was "aborning." They were already an international organization of engineers and contractors for various kinds of industrial plants, but apparently had just begun to manufacture machinery for the cement industry. A reproduction of the firm's earliest circular for use in America is shown on page 104.

But these engineers were not content to manufacture established types of European machinery; they began to design and build new and improved types, particularly of grinding machinery. So, to distinguish the new from the old they began to give special names to each piece of new machinery, until the average cement-plant operator began to find his memory taxed to keep track of them.



One of the first "kominuter" or closed-circuit ball mills

Even now we will not attempt to list them all. The first and perhaps the most famous was the Lindhard Kominuter, named after the man who for many years was chief engineer of the company and the inventor and patentee of much of its machinery.

We have before us a catalog, without date, which apparently was the first piece of literature on the Kominuter, and an earlier Davison tube mill. A comminuter is, of course, a machine that comminutes, and the catalog carries a reproduction of part of a page from the Century Dictionary, which gives the definition of the verb "comminute." The Century Dictionary was and is the most complete dictionary of the English language (about 12 volumes, we know because we have one). The word comminuter was not listed, so evidently it was coined by our Danish friends, but for reasons of their own, possibly to be sure of a copyright, they spelled it with a K after the German or Danish way.

The Kominuter is a ball mill, but it isn't like the Krupp ball mills which were in use in cement plants at the time. According to this catalog the Kominuter could carry 50 percent more balls than the ball mill; it had 50 percent more efficiency per square foot and gave 65 to 85 percent more output per horse-power than the contemporary ball mills. The ball mill had perforations in the grinding plates on which the balls rolled, and this was a disadvantage because the "peening" (or hammering) action tended to close the perforations and reduce the output which had to go through the perforations. In the Kominuter the screening was done at

the discharge end of the mill and the oversize was returned to the feed. In other words it was a self-contained, closed-circuit mill.

There followed a long line of cement-plant machinery, each bearing a distinctive trade-marked name, among which was the Trix separator for wet-grinding in closed circuit—a centrifugal separator of a kind. The Lehigh Portland Cement Co. plants, which were begun about 1898 and nine or ten completed within eight or nine years, were equipped with Smidth Kominuters and tube mills as were many other early plants.

From a description of the Missouri Portland Cement Co.'s Velo cement plant, published many years later in ROCK PRODUCTS, it is evident that this firm's engineers have given considerable thought to the time-temperature-kiln speed equation, which, as we have noted elsewhere has never been given the study it deserves, if we are to find out the real function of a rotary kiln as a chemical-reaction machine.

How Big Crushers Were Developed

By RICHARD BERNHARD

THE WRITER has been continuously associated with the design and manufacture of rock and ore crushers for the past 56 years, and has had a prominent part in the development of both the gyratory and jaw crushers.

It was a long step from the old hand methods of reducing or crushing rock to the jaw crusher and it was likewise an equally long step from the jaw crusher to the gyratory type. Because of certain limitations in the jaw crushers then on the market, quarry owners had long desired a machine which would give continuous crushing to a smaller and more uniform product. This desire resulted, over a period of years, in several experimental machines being built, using the old coffee grinder principle, but they were all unsuccessful for various reasons.

The first successful gyratory crusher was manufactured about 1879 by the Eagle Iron Works, Chicago, Ill. It was designated as size No. 4 and was installed in a limestone quarry at Marion, Ohio. Even though several gyratories had previously been built, there was no worthwhile operating experience to fall back on, consequently the entire design of this gyratory crusher was a pioneering undertaking.



Richard Bernhard

The first machine was constructed with a shaft made of cast iron, but when put in operation, it broke on the second day. A wrought-iron shaft was then made to replace it, and after it was installed the crusher operated satisfactorily.

Selling the Gyratory Crusher

Owing to the novelty of the design of this gyratory crusher, it was very difficult to introduce it into the rock quarries because the only experience crushed-stone operators had had in those days was with the jaw crushers. However, by reason of the fact that the crusher worked so satisfactorily at Marion, O., the Eagle Iron Works

(Continued on page 149)

The Author

• RICHARD BERNHARD, for many years chief engineer of the Traylor Engineering and Manufacturing Co., probably knows more about the origin and development of rock crushers than any man now living. His life work has covered the development of the gyratory crusher almost from its inception.—*The Editors.*

F. L. SMIDTH & CO.

CONSULTING & CONTRACTING ENGINEERS.

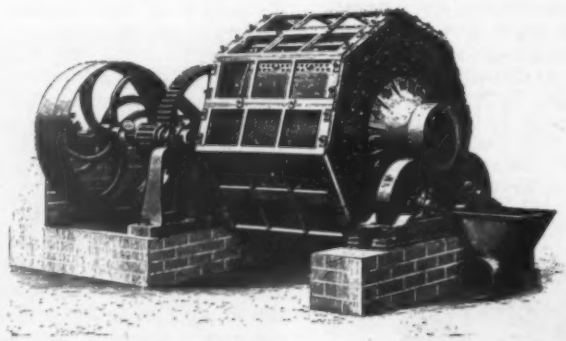
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TURIN.

One of the first circulars issued by F. L. Smidth & Co.

Quarrying

(Continued from page 102)

J. A. Rigg, Acme Limestone Co., Fort Spring, W. Va., commented interestingly on evolution of the crushed stone industry as follows, quoting him in part:

"My knowledge of the crushed stone business goes back about 40 years. The only use for crushed stone at that time in this section of the country was for railroad ballast. Plants at that time seem to have been built on a more or less standardized plan; a No. 7½ or 8 gyratory as a primary crusher, a No. 5 for rejections, an elevator, and a revolving screen with dust jacket for making three sizes—ballast, chips, and screenings. Some plants had only two bins, one for ballast and one for chips, and the screenings flowed directly from the screen into a railroad car. Stripping was done by hand and quarrying was done by the bench method with piston drills.

"The stone was loaded by hand into low-side, end-dump cars holding about 2 cu. yds. The loaded cars were dropped to the mill by gravity and the empties hauled back by mules. The cars were dumped into the crusher by being pulled up an incline at an angle of about 45 deg., the end gates being automatically tripped when the car was in the proper position above the crusher.

"These methods largely prevailed until shortage of labor during World War I brought the introduction of steam shovels into the quarry. These were railroad-type shovels as there were no revolving shovels in existence at that time. The introduction of the steam shovel in turn made a larger primary crusher necessary. No change in the design of plant was made necessary due to this. A larger primary crusher, either jaw or gyratory, was set up in front of the existing plant and locomotives and 4 cu. yd. side-dump cars were substituted for the smaller cars and mule power.

"In the meantime the pneumatic hammer drill had been developed which was a great improvement over the slow, ponderous, piston drills and well drills were being employed for primary drilling.

"The development of the hard roads movement, with the consequent demand for macadam material, compelled the adoption of more efficient screening methods, resulting in the rapid evolution of the shaking or vibrating screen and the introduction of washing plants to meet the demand for clean stone.

"Up to this time screenings were entirely a waste product and chips brought a very low price. Some several producers, among whom we were one, in the early 20's began an investigation of converting limestone screenings into fine aggregate for concrete. Research and engineering experience brought on the necessity of operators producing many different sizes of stone for road work and chips began to command a premium, and the increase in demand made necessary the installation of fine reduction crushers.

"Producers of crushed stone who were alive to the situation recognized in the early '20's that they were leaving the realm of ordinary stone crushing and getting into a manufacturing job. By the middle '20's manufacturers of machinery were aware of this changing situation and were putting forth great efforts to meet the demands of producers for improved machinery of all kinds. Engineers were becoming more and more critical of material furnished them and specifications were becoming tighter. The importance of the testing laboratory, both on the part of the consumer and the producer, was becoming more and more apparent.

"From that time until the entire country turned all its energies to fighting World War II the crushed stone business increased in volume with the consequent building of larger and better plants, including many refinements. Today, it is a manufacturing industry serving diverse and multitudinous markets with many products of high quality, at prices consistent with necessary costs, and manned by organizations of trained and skilled men. The day of the old time stone crusher is gone."

BLASTING DEVELOPMENTS

The following interesting remarks covering trends in blasting technique and developments by the company in making available new products were submitted by Atlas Powder Co.:

"There have been many important advances in the use of explosives in quarrying in the last 50 years. Explosive energy is, of course, basic to the removal of rock from the earth on the scale demanded by present needs. Modern machines to speed up rock handling have placed an ever-increasing burden on explosives and the blaster. More tons per man-hour and more tons per dollar cost are the criteria. Uniform, consistent high fragmentation, reduced secondary shooting and clean back break, all mean more tonnage per dollar and at lower cost with lower upkeep of equipment.

"As population grows and homes, factories and businesses move nearer to quarry sites, vibration from blasting is an ever-growing problem. Safety is always important. All of these, along with economy, are the goals of the explosives engineers.

"Old dynamites of 50 years ago were comparatively simple mixtures, nitroglycerin dynamites and gelatin dynamites, mostly depending on nitroglycerin for their force. Usually speedy, shattering and relatively sensitive, they left much to be desired.

"The adoption of ammonium nitrate as an explosive ingredient in order to provide more desirable pressures for different rock formations was one very important development for the rock products industry. The slower acting explosives developed greater heaving power and stressed rock for better breakage at lower cost and with increased safety. The ammonia type dynamites gave increased safety. The use of ammonium nitrate was gradually increased, first, to produce the so-called extras and then even higher ammonium nitrate and less nitroglycerin gave us the newer dynamites. Atlas introduced Apex, a very high ammonium nitrate with low nitroglycerin content, which has been very effective. The Amodyn series by Atlas also represents an advance, providing a series of explosives for various types of work. Another development was origination of the free flowing powders, which are packed in bags, poured into the bore hole, or insome cases loaded by blowing. Atlas Flo-dyn, represents the highest development in this group. The development of large size cartridges and methods of lowering them into the bore hole was another advance.

Electric Blasting

"Probably the next important development of significance to the quarry field was the electric blasting device, which was really developed in the last half century. This permits accurate control by the blaster in firing one or more charges. Charges may be fired from a safe distance. They may be fired singly, or any number may be fired together. The charges may be fired simultaneously, in effect, or they may be fired with controlled delay intervals ranging from a few ten thousandths of a second on up. In this field, Atlas developed a special type insulated ignition device, which provides a high degree of accuracy and reliability, since the fired compound is tightly shrunk around the bridge wire. The company further improved the electric blasting technique by the development of a metal shunt attachment. Handling and unfolding wires on electric blasting caps was simplified and improved by the introduction of the Atlas Accordion Fold, which provides a convenient, easy to carry, easy to open and easy to prime, individual packing.

"The all-metal delay electric blasting caps first introduced by Atlas are compact and accurately timed to give greater control in the firing of charges. Another development which had considerable influence on safety was the use of nitro-mannite as a detonating compound. This product is sold under the name of Manasite.

(Continued on page 152)

SAND and GRAVEL Industry Grows Rapidly with Concrete Construction

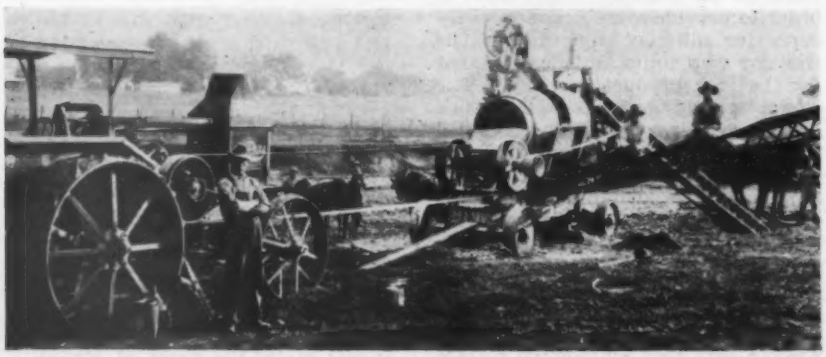
By NATHAN C. ROCKWOOD

ALTHOUGH SOME BRANCHES of the sand and gravel industry, particularly mortar and plaster sand, and foundry sand, are very ancient, these materials were invariably obtained from very small operations, and were used with practically no preparation, except to screen out pebbles and extraneous materials. That is the picture of the industry at the time our journal was born, in 1896. The concrete construction industry was just coming into existence, and concrete aggregates were whatever nature supplied; usually, the preferred aggregate was crusher-run, crushed stone, on the assumption, apparently, that what had come from a solid contained all the necessary size gradations to reincorporate into a solid, with a minimum of cement binder.

That philosophy is easy to understand because the standard method of proportioning cement to aggregates was to determine roughly the percentage of voids in the total aggregate, by volume, and then see that all these voids were provided with cement to fill them. The writer was himself a "concrete inspector" on an electric railway construction job in the early 1900's, although still a student, and his instructions from the chief engineer were to test the aggregates that were to be used, first by filling an ordinary water bucket with water, counting the number of dipper-fulls to fill it; dump out the water and fill the bucket with the aggregate; count the number of dipper-fulls of water to bring the water flush with the top of the aggregate; and presto!, a little mental arithmetic gave you the percentage of voids to be filled with cement or the proportion of cement to use. In this particular case, the contractor was using a bank sand and gravel, only the gravel was almost entirely absent, so some very fine bridge abutments were built with practically a 1:3 mortar, much to the agonized wails of the contractor.

This kind of concrete construction was followed by the fixed ratio kind, 1:3:6 being most popular for ordinary jobs. Cleanliness of aggregates was early recommended, but not much practiced for a number of years, as fine silt and clay, up to 6 or 7 percent were looked upon as desirable rather than otherwise. However, as early as June 1899, S. B. Newberry, the country's leading authority on portland cement and concrete, was stressing, in an article in our journal, the necessity of obtaining good adhesion between the cement and aggregates, and emphasizing the necessity for clean aggregates. He said "*in some cases* (italics are ours) washing the aggregates *may be* necessary."

There were even then some sand and gravel operations where the materials received a washing of a kind. In general these were river sands and gravels, and the washing they got was more or less incidental to their recovery. In the course of our editorial travels the oldest existing sand and gravel business we came across was (and is) the Builders' Sand and Gravel Co., Davenport, Ia., which, when Edmund Shaw, of ROCK PRODUCTS, visited it in 1924, had been in continuous existence for 70 years. Hence, if still active, and we believe it is, the operation is 92 year's old. The plant and equipment in 1854 was a single scow, propelled by push pole. It was anchored alongside a Mississippi River sand bar, and laborers with shovels and wheelbarrows went on the bar and loaded the scow over a gang plank. Perforated shovels were used to allow the sand to drain, as the wheelbarrows were loaded.



An early type of portable aggregates plant (Iowa) used in Ohio to process creek gravel

Sand and Gravel Come to Top

Concrete experience with crusher-run, crushed stone, in some instances that got a lot of publicity, was not satisfactory. The reason was not apparent then, but of course now we know that at least some of fines, or stone dust, should have been removed to make room for the cement. Also, probably, the crushed stone, prepared dry, was dust covered and good adhesion of the cement was prevented. However, these facts not being discovered, construction engineers did discover that sand and gravel made equally satisfactory aggregate, and it was not long before these materials practically crowded crushed stone out of the field. Crushed stone, being a more expensive aggregate to prepare, could be sold only as a premium aggregate for special purposes, or only where no natural sand and gravel was available in sufficent quantities.

Along about this time—say the first decade of the present century—engineers and architects began to bear down on cleanliness of aggregates, with the result that for the next quarter century only the coarsest sand was considered the best for concrete. At the end of that period, possibly because portland cement was now being much finer ground than formerly, the same engineers and architects, or their successors, began to deplore the lack of fines in concrete sands so now we are in the midst of a reversion to the former practice of retaining these fines in the sand. This is the most pronounced trend in the industry at present.

Another problem that has arisen to plague sand and gravel producers in many parts of the country, is to find a means of ridding their gravels of so-called "soft" and unsound pebbles, or rock fragments. Concrete construction engineers have always put stress on the necessity for coarse aggregates to be "sound, hard and durable," but in the early years not too much attention was paid to this specification, and experience shows that in many instances where the concrete, or the mortar, was good, this specification seems to have been ignored with impunity. Today it is near the top of the list of practical problems to be solved—that is, just

how important is the soundness and durability of coarse aggregate in a really good concrete, otherwise?

Early Tests and Specifications

The first suggestion for a thorough-going, scientific testing of aggregates, to determine their concrete-making properties, we find in our September, 1905, issue. It was proposed by the president and secretary of the newly formed American Society for Testing Materials that tests be made of all kinds of aggregates at the laboratory of the U. S. Geological Survey, in St. Louis, Mo. The samples were to be collected by a special representative of the laboratory sent out for that purpose. The things that were considered important may be judged from the outline of suggested data to be compiled: *(A)* Examination of the deposit, as to extent and nature of material from which the samples were collected. *(B)* Physical tests: (1) mineralogical examination; (2) specific gravity; (3) weight per cubic foot; (4) sifting (granularmetic composition); (5) percentage of silt and character of same; (6) percentage of voids; (7) character of particles as to percentage of absorption, porosity, permeability, compressive strength and behavior under treatment. *(C)* chemical test as to character of stone, silt, etc. Apparently this survey was never carried out. The U. S. Bureau of Public Roads subsequently gathered some similar but not so complete data on rock deposits. The "Atlas" articles on the aggregate deposits in the various states, now current in ROCK PRODUCTS, seem to be the nearest approach to such data yet attempted on a national scale.



Slackline cable-way excavator (Sauerman) operation by Indiana Gravel Co., on the White River about 1912. One of the first installations in a sand and gravel plant operation

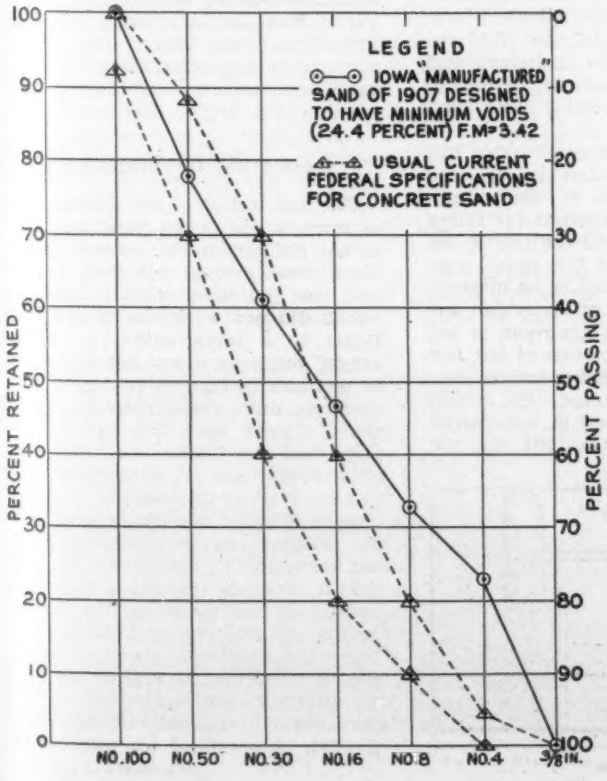
The earliest attempt we find in the record, to show how ordinary sand could be very much improved by proper grading, was an article by M. J. Reinhart, Ames, Ia., in our February, 1907, issue. He wrote, in part: "I have attempted to determine and show how ordinary sands could be improved by screening, or by addition of proper material to give the minimum amount of voids, and thus afford maximum results at the least possible cost. The sand I have used is a bank sand taken from the college pit and is of exceptionally good quality, containing about 30 percent voids, while the ordinary run of Iowa sands contain 30 to 40 percent voids. It is a comparatively coarse sand and largely free from earthy materials, All over No. 2 mesh was rejected. The sizes used were No. 4, No. 8, No. 16, No. 30 and No. 50 meshes. The weight and voids in each size fraction were determined. Then enough of the size below was added to fill the voids." He then goes on to tell what the voids in each fraction were, and how he compounded a mixture which had the following proportions:

	Accumulative
Passed No. 2, retained on No. 4	22.9 percent
Passed No. 4, retained on No. 8	33.1 percent
Passed No. 8, retained on No. 16	45.7 percent
Passed No. 16, retained on No. 30	61.2 percent
Passed No. 30, retained on No. 50	78.8 percent
Passed No. 50 (21.2 percent)	100.0 percent

This mixture had 24.4 percent voids. We have plotted this sand as it would be plotted at the present time in order to compare it with what would be considered good concrete sand under present specifications. William B. Fuller had developed this method of showing sand (and aggregate) gradations several years befor 1907, but the idea of the Fineness Modulus came several years later from Duff A. Abrams. It will be noted that this "ideal" sand of 1907 is much coarser than that now specified.

Prof. Reinhart was apparently the first to show how sand and gravel producers could "manufacture" sand to any desired gradation, for his article gave the exact procedure. Start-

(Continued on page 146)



How early Iowa specification compares with Federal sand specification

HYDRATED LIME

An Important Development

FROM A COMMERCIAL standpoint at least, the most important development in the lime industry in the past half century, since 1896 when our journal was founded, to be exact, was the introduction of dry hydrated lime. Quick lime is a perishable commodity and a more or less dangerous one to handle since it has to be kept away from any possible water leakage. In 1896 quick lime was the only lime product on the market, and it was shipped almost exclusively in wooden barrels. The introduction of hydrated lime in paper bags immensely expanded the markets, because it was safe and convenient to handle, and many more dealers and jobbers could handle it.

Apparently, although the record is not clear, the Buckeye Lime Co., Genoa, Ohio, was among the first to make a dry hydrate. A news item in our September, 1901, issue, says that this company was placing a powdered lime upon the market, manufactured under a patented process. We know that various patents were issued for processes of making hydrated lime, because in our April issue, 1903, is a fairly complete description of the plant of the New York Lime Co., Natural Bridge, N. Y., which was using a newly developed and patented process. The report said: "The new process consists of a storage room for fresh lime 40 x 18 ft. by 12 ft. high; a trench room for slaking the lime, 100 x 18 ft., which contains two concrete trenches 100 ft. long by 5 ft. wide by 6 ft. deep, and between the trenches a concrete trough containing a spiral (screw) conveyor. The mill proper is 36 x 28 ft. and stands 52 ft. high, to which is added a store room 25 x 24 ft. This plant makes a hydrated lime by the process of the National New Process Lime Co., New York City, and was installed under the supervision of F. D. Cone, president of the company".

No description of the actual processing is given, but it would appear from the illustrations that the lime was pulverized in the mill building, probably mixed with water in the screw conveyor, and deposited in separate compartments of the concrete trenches, to complete the hydration. It may have been that the lime was hydrated in the trenches and recovered by the screw and then milled. It was one of those "secret" processes, so common in all industries of that period. Later, in February, 1904, two other processes were advertised in ROCK PRODUCTS, one by O'Connell & Feely, New York City, and one by A. H. Lauman, American Hydrating Co., Delaware, Ohio. Apparently the Ohio dolomite finishing lime industry led in adoption of hydrated lime and most of these plants were soon equipped to make the dry hydrate.

Mechanical hydrating machines did not come until about 1904 and the batch hydrator of the Clyde Iron Works, Duluth, Minn., appears to have been the first especially designed for the lime industry. However, the screw type hydrator, or something similar, had been used for a number of years in the sand-lime brick industry. The Kritzer Co., Chicago, Ill., entered the business about 1906 as "lime hydration engineers," and Charles Kritzer, long prominent in the lime industry, was then designing and supervising construction of hydrated lime plants, employing in the beginning the Clyde hydrator. The following year, 1907, he introduced his Kritzer continuous hydrator. Both types were extensively used until recently, when pressure hydrators and other designs especially for hydrating the magnesia in dolomite limes were introduced.

The full market possibilities of hydrated lime could not be realized until the invention of the paper, valve-bag and the machine for filling it. The story of the invention of the Bates valve bag and the Bates bag-packing machine would be an intensely interesting story of American ingenuity, but there is not room to tell it here. It is perhaps one of the few most infringement-proof devices ever invented and patented. Pulverized lime had been shipped in waterproof paper bags as early as 1904, but not in valve bags, of course. Our May issue of 1904 reported the Swanton Lime Works, Swanton, Vt., was packing crushed, fresh burned quick lime in waterproof paper sacks, made for them by F. W. Bird & Son, Walpole, Mass. This would make it appear that the bags had a tar or asphalt diaphragm. The report said the lime slaked no more readily than in wooden barrels. However, waterproof paper bags were not generally adopted until many years later.

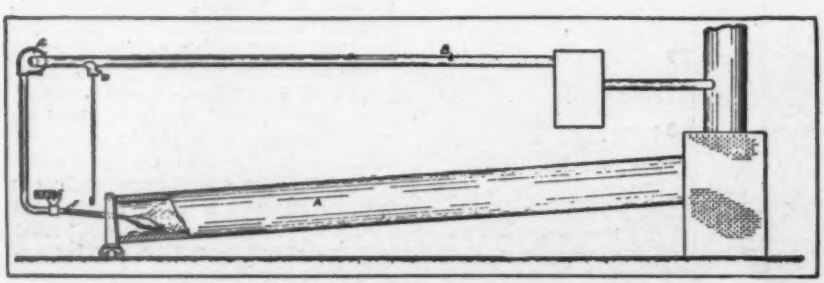
In answer to an inquiry by the writer, J. J. Urschel, Woodville Lime Products Co., Toledo, Ohio, has supplied the following data on the first valve-bag installation in the lime industry: "The first bagging machine for lime was placed in our plant and it was very crude. It had no seat in the chair and the paper bag was held by the tube until it was filled, which made a very difficult operation. Later on chairs were placed in the bottom on which the bag could rest when being filled. There were many sold to other lime manufacturers. After a great deal of experimenting at our plant, a company was formed for the manufacture of these machines, and they were then sold and installed in other plants.

"Mr. Bates was the inventor of these machines. He approached the writer to conduct the experiments at the Woodville Lime Products Co. plant, where the machine was tried out and such changes made that a completely satisfactory operation was possible. We then organized a company, known as the Urschel-Bates Valve Bag Co., and in which the writer not only took a very active part, but mostly promoted. This company was very successful and it was most helpful to the lime industry."

Operating Developments

The lime industry has certainly had as many crazy suggestions tried out as any industry in this country. Lime plant owners were notorious "suckers" for patented ideas, most of which did not work out in practice. Being to a large extent a "backwoods" business, it was not attractive to technically trained engineers and chemists until comparatively recent years. There were, however, exceptions, and the Warner Co., Philadelphia, Penn., and its predecessor, the Charles Warner Co., was one of these. Charles Warner and his brother Irving Warner are both graduates in engineering of Cornell University and both have made important contributions to the technology of lime manufacture. Another engineer who became interested in the science, as disinguished from the art, of lime burning, was Byron Eldred, a graduate in engineering of Dartmouth College, class of 1894. A result of his application

(Continued on page 146)



Eldred firing process (April, 1906) applied to rotary kiln

From Hand Labor To MACHINE AGE

ROCK PRODUCTS readers extend congratulations on Fiftieth Anniversary and reminisce on developments in the industry

While it is true that a few companies in the rock products industry can trace their beginnings back over a hundred years ago, the commercial aspects of the industry really started to take form about fifty years ago when Rock Products immediate predecessor, Cement and Engineering News commenced publication.

In looking over the numerous letters of congratulations on the Fiftieth anniversary of Rock Products which have come across the editorial desk, it is interesting to note the many references to progress which these companies have made and the part which the publication has played in promoting the general welfare of the industry. We wish to take this opportunity of thanking all our readers and particularly those who wrote to us on this occasion expressing their friendly sentiments of appreciation for the service the publication may have been to them individually and to the industry. Many of these readers have taken the publication since its very inception, and quite a large number have been readers since they started in the business. From a business largely dependent on hand labor and horses and mules, the industry has grown to be one of the most highly mechanized in the country.

The letters indicate that many companies in the aggregates business started out as contractors and became interested in the production end merely to secure a source of materials. Later these companies either divorced their contracting business from that of producing aggregates or devoted their entire energies to the new business. There are still quite a number who are engaged in contracting.



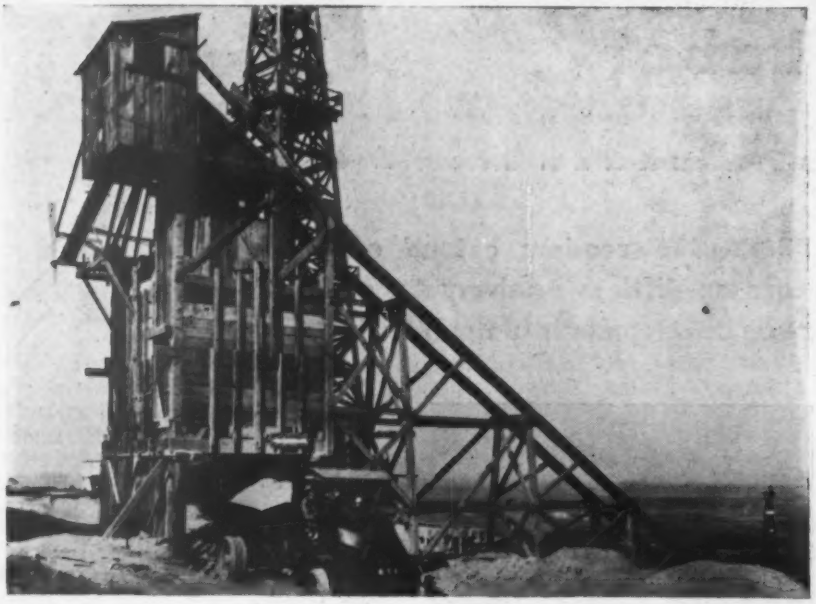
Paul C. Graham, one of the founder brothers of Graham Brothers, Inc., Los Angeles, Calif.

Contractors Become Producers

As an example of a company which was organized as a contracting firm there is an interesting history accompanying a letter from Graham Bros. Inc., Los Angeles, Calif. Established by three brothers, Robert, Paul and Edward in 1909 in Long Beach, Calif., to engage in hauling, grading, excavating, and teaming, the partners widened their operations to include the production of sand and later crushed stone. The first plant in operation was a sand pit on Signal Hill, Long Beach, scene of the famous boom in the early days of California oil. Immediately adjoining this plant on the south was the first oil well to come in on Signal Hill. Later crushed stone operations were established on Santa Catalina Island which was followed by another sand pit at Harbor City, near San Pedro, Calif. Incorporated in 1922, Graham Brothers, Inc., grew with the rapid development of the area, and the company's interests and emphasis slowly turned from its original contracting business until in 1930 it became established as a large producer of aggregates with plants strategically located to serve the entire Los Angeles area. It was also in this period that the company started the production and sale of ready mixed concrete. Today, under the leadership of Paul C. Graham, surviving founding brother, the company is meeting unprecedented production and delivery demands with the finest truck fleet and production equipment in its history. Illustrations shown herewith depict the progress which this company has made.



El Monte operations of Graham Bros., Inc., showing the most modern sand and gravel plant



First production plant of Graham Brothers at Signal Hill, Calif. Note first oil well on Signal Hill, to the right



Present modern haulage and loading equipment at Marblehead quarry



Showing the crude methods of handling rock in the early days at Marblehead quarry, Kelley Island Lime and Transport Co.

E. EIKEL of Servtex Materials Co., New Braunfels, Texas offers the following message of congratulation: "Through the years your publication has been a trade journal par excellence for the industries it serves. ROCK PRODUCTS and I have been keeping company since before 1909, the year crushed stone was first produced at New Braunfels, Texas. In those early days mule drawn carts were used for the haul from quarry to crusher. Carts were loaded by hand and the large pieces of quarried stone sledged down to crusher size the same way. The original crushing plant was a simple affair; a gyratory crusher, a revolving screen, a bucket elevator and a two-compartment wooden bin. Only two sizes were made, concrete stone and screenings. When two 40-ton cars were loaded in a single day, that was good production. To either wash stone or ship it precoated with asphalt was unheard of.

"Today quarry-to-plant haul is performed with 15-ton Diesel trucks. Electric power shovels do the loading in the quarry. Four separate plant units are operated; a primary crushing unit; second crushing unit; washing unit, and a plant where stone is asphalt-coated. Trainloads are shipped daily and countless sizes are made. Not all stone is being washed, but it soon will be as part of the needed equipment is on the ground and some of it has been installed."

A. B. MACK, executive vice-president of The Kelley Island Lime and Transport Co., Cleveland, Ohio, in his letter of congratulation is quoted as follows:

"We congratulate ROCK PRODUCTS on the occasion of its Golden Anniversary. It may well take pride in its accomplishments during the past 50 years, having always been a constructive factor with a high standard of editorial policy and its timely discussions of matters of interest to the industries it serves.

"The Kelley Island Lime & Transport Co., organized in 1886, began doing business under its present name in January, 1887. The purposes of the founders, as stated in its original articles of incorporation, may be of interest: 'To quarry stone, burn lime, harvest ice, cultivate the soil for cereal and other crops, and to buy and sell goods and merchandise of every kind, also to carry and transport all kinds of goods, merchandise and products of the earth, by land or water, or both, and to supply all necessary means therefor'."

"Many men well known in the lime and limestone industry have headed the Kelley Island organization, among whom were Caleb E. Gowen, John A. Kling, George J. Whelan, and its present president, Ralph L. Dickey."

Commenting on the progress of the company extending over more than fifty years, Mr. Mack referred to two

pictures of the company's White Rock plant, one taken in 1891 and the other in 1946 as depicting the progress which had been made, and recounted the following:

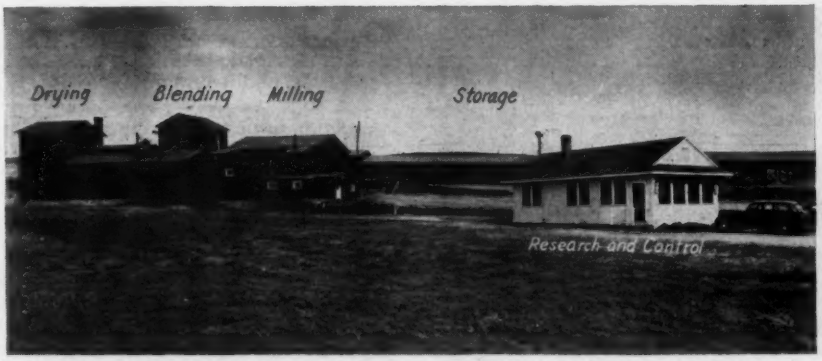
"Kelley Island pioneered in the adaptation of crawlers to the old railroad type steam shovel, and today two electric revolving crawler type shovels load more stone than from 5 to 7 of the old steam shovels of the same dipper capacity. The company also was one of the first, if not actually the first to adapt the rotary kiln to lime burning, and it has contributed in many other ways to the progress made by the lime and limestone industry.

"With full confidence in the future we are embarking on an improvement program which includes additional production of both lime and limestone products, the cost of which over the next two years will exceed a million dollars and may well run into several millions as the plans crystallize."

Sand Company Over 100 Years Old

Perhaps the oldest company now engaged in the rock products business is Whitehead Brothers Co., New York, N. Y., which was started by Samuel Whitehead in 1841. Certainly it is the oldest company engaged in the production of foundry sand. In addition to being the first company in this field in America, it is also unique in that the founder's family is still represented in the management to the fifth generation—an unusual circumstance in our economic system. A complete story about this company's operations, including its remarkable history, appeared in ROCK PRODUCTS, February, 1943. It is of interest to note that Alfred J. Miller, president and general manager of the company, started with the company in the year 1895, shortly before ROCK PRODUCTS commenced publication.

O. J. ELLINGEN, vice-president of H. D. Conkey & Co., Mendota, Ill., pioneer producer of sand and gravel, in congratulating ROCK PRODUCTS, offered the following comments: "As the Rock Products Industry passes in review, and we consider its progress in the light of our own experience beginning in 1912, we are reminded of our initial efforts—screening sand and gravel through a "grizzley," loading into cars that which appeared would produce good concrete, casting aside oversize materials and waste sand. In retrospect, while our plants, as they existed, were improved from year to year to meet new specifications and new demands, we have come to believe to a considerable extent that other factors had more to do with our development than did we. Nature favored us with good deposits. The Portland Cement Association in its early years promoting the use of concrete, particularly for pavement, provided the inspiration to us all to recognize its practicability. The Engineering Department of the National Sand and Gravel Association, working in close harmony with the engineering departments of the various States and with industrial engineers of design likewise gave impetus to a fast growing new endeavor.



Modern moulding sand plant of Hougland and Hardy, Inc., as it appears today



C. M. Hardy, president of Hougland and Hardy, Inc., Evansville, Ind.

C. M. HARDY, president of Hougland and Hardy, Inc., Evansville, Ind., commented as follows on the developments within the industrial sand business:

"Thirty-five years ago when Hougland and Hardy started in the molding sand business, production was by hand and hauling was done in wagons and only such deposits that had a short haul to a railroad could be worked. Today deposits several miles from a railroad can be utilized due to truck transportation.

"About 1920 much of the moulding sand was being milled before shipping—probably this was the first improvement, but at that time there were no standard tests accepted by the industry and for uniformity both the producer and the foundry had to depend on "feel and squeeze" to guide them.

"The producer and the consumer now speak in common terms. Standard tests have been established and approved by the American Foundrymen's Association. Through laboratory control, sands today are produced to prescribed grain sizes, permeabilities, clay contents, strengths; and they are now dried, milled, screened and aerated.

"It is probable that the postwar period, at least for the next few years, will see a very large demand for molding sand and new technological developments in the foundries may bring further improvements and refinements in sand production.

"Such publications as ROCK PRODUCTS through their articles and advertisements have been very beneficial to the producers of crude material from Mother Earth who has been



Moulding sand plant of Hougland and Hardy, Inc., as it was operated in 1920



James A. Barr, chief engineer, International Minerals & Chemical Corporation

so generous and enriched the lives of every one of us."

Stone Sand Development

W. D. Bobbitt, manager, Radford Limestone Co., Inc., Radford, Va., in his comments on developments in the industry told about the methods and equipment devised to manufacture stone sand. "In 1937, the Appalachian Electric Power Co., began the construction of large hydro plant very close to our quarry property. I was asked by the chief engineer if I could develop a stone sand that would equal the strength and workability of natural sand. I immediately set out to see what other producers were doing, and found that several were making stone sand, but the particle shape was so bad that it could not be used successfully unless mixed 50-50 with natural sand. This of course made it prohibitive. Rock Products, April, 1938 issue described the plant and equipment. It is my belief that we were pioneers in the development of a workable sand.

Another achievement we are proud of is the development of a very high quality mortar sand. In 1942, the Appalachian Electric Power Co., increased its steam-hydro capacity at Glen Lyn, Va., at a cost of $8,000,000, and the assistant chief engineer conceived the idea that stone sand, properly graded, would make a good brick mortar sand. He found that mortar made from this sand was waterproof, had a higher strength, and would lay more brick than natural sand and that a bricklayer could lay 10 percent more brick with it. All the brick on this project was laid with our mortar sand. We advised the Engineering department of the Government, which at that time was building Radford Ordnance Works, of our development, and they began using it in large quantities. Today, we are receiving more orders than we can fill for local building, as well as various other projects that are within reach of our plant.

"It is a pleasure to do anything I can for Rock Products, as it has been a great source of help during the years I have been in the crushed stone business. I believe that I have been reading it since it was first given the name of Rock Products."

Modernizing Phosphate Recovery

James A. Barr, chief engineer, International Minerals & Chemical Corporation, reveals some interesting historical developments in the phosphate industry in his letter.

"We are now the largest producers



New Universal Atlas plant at Northampton, Penn. It is a composite of four separate plants: a flotation plant for treatment of raw materials; a gray portland cement plant; a white portland cement plant; and a plant for generating power, mostly from waste heat



W. B. Bobbitt, Radford Limestone Co., Inc.

in the United States, and have consistently maintained our position as being among or the first to discover and adopt new methods and processes.

"We first installed Dorr classifiers and other Dorr metallurgical equipment in Tennessee about 1913 which materially increased the recovery of fine phosphate, formerly wasted. Then about 1914, we adapted steam crawler mounted draglines for stripping and mining which revolutionized mine methods in Tennessee and Florida and enabled much higher wages to be paid.

"We steadily kept pace with the usual improvements such as electrification and modern washing methods to meet increasing tonnage demands by being the first to install large dryer units with high air volume, high efficiency cyclone collectors based on the author's work in Tennessee. A central grinding unit using super-mills replaced many small units scattered around the country.

"It was in 1927 that the writer started flotation research, and built the first pilot plant in Florida to develop a process that is such an important factor in phosphate production today."

"In Florida where one single mine's capacity has been increased from 300 to 4000 tons per day, we are building the largest non-metallic flotation plant and have just finished installing a 21 cu. yd. dragline which was the world's largest. But facts soon become history in this age.

"We were first in the complete modern mechanization of New Mexico potash mining, but that is a different story.

"As to the future, we have visions which we are entrusting to research to solve which will unlock the tremendous reserves of phosphate of too



Original quarry and plant erected in 1912 at Auburn, N. Y., which is now part of the extensive General Crushed Stone Company properties

low grade for the markets near these deposits.

"We did not do all this, hiding in an isolated corner, but gained many ideas by contacts with others and especially by consistently following the progress of the industries as a whole through such magazines as ROCK PRODUCTS which has been on our reading tables all through the years."

Progress in the Cement Industry

L. T. SUNDERLAND, president, Ash Grove Lime & Portland Cement Co., Kansas City, Mo., writes, "Half a century is a long time for any institution to survive the vicissitudinous changes which inevitably take place over such a long period, and I congratulate you upon that achievement. ROCK PRODUCTS has occupied a position of great usefulness in its chosen field, and I trust it will continue to progress and prosper."

UNIVERSAL ATLAS CEMENT CO., made the following comments on the part the company and its predecessors had played in the cement industry. "Since its first plant started in November, 1889, revolutionary improvements have taken place in the manufacture and uses of cement. In many of these the company was a pioneer. It pioneered in industrial safety, introduced the first rotary kiln, the use of powdered coal, the use of gypsum for retarding setting time, the first calcium-aluminate cement and the first retarded oil-well cement. It set up the first cement and concrete research laboratory and pioneered in the promotion of concrete roads and in the farm uses of concrete." The company also referred to the development of air-entraining portland cement, the company's studies having started back in 1935, even going so far as constructing an experimental road at its Hudson, N. Y., plant, to study the effect of the use of air-entraining cement used in concrete pavements. It also was the first in this country to develop the use of granulated blast-furnace slag instead of clay or shale in the manufacture of portland cement.

ROLAND WHITNEY, secretary of the Louisville Cement Co., in his comments on the part his company had in the industry's development, pointed out that Chairman of the Board, W. S. Speed, first went to work for the company in 1895, preceding ROCK PRODUCTS' entry upon the scene by a year.

"We are especially proud of our role of pioneer and leader in the field of masonry cement. In 1916, we introduced Brixment, a cement especially developed for masonry work of all kinds, and as far as the writer knows, the first such material ever marketed.

"As to plans for the future, our company has a definite program outlined for the next three years involving extensive repairs and replacements necessary to put our plants in the efficient operating condition in which we try to keep them. Much of this work would have been done in the past few years, but for the war. We are expecting several years of unusual activity in all branches of construction and feel that only by the gross mismanagement or the appearance of some factors now entirely unforseen, could there fail to be reasonable prosperity for the industry and all of us who supply it."

From 50 Tons to 10,000 Tons

ERIC W. RYBERG, president of Utah Sand and Gravel Products Corporation, Salt Lake City, Utah, passes on some interesting history concerning his company's growth in step with the State's rapid industrial development and population increase.

"In 1910 we were small contractors. Concrete contractors then developed their own sand and gravel deposits. Our first operation was a small set of bins, probably 25-cu. yd. capacity, with gravity screens on which we made reseparation, one for sand and one size aggregate we wanted which was usually 2-in. minus; the balance being oversize which was wasted. There was no crushing during those days. Materials were brought to the gravity plant by teams and tongue scrapers; about 50 tons a day would have been a pretty good operation. This was for sidewalk construction.

"About 1916 we entered into concrete paving operations, and required larger volume with better separation. We erected a plant with about 250 cu. yd. of bin capacity with an elevator to elevate material up to the top of the plant and through a trommel screen, making sand and gravel minus 2-in., with the oversize returning to a small crusher set adjacent to the elevator which returned it to the trommel screen for resizing. This was the first mechanical plant in the Salt Lake area and operated until 1918.

"By this time washing of aggregates was demanded in this area, and the old Utah plant, located in Salt Lake City, was designed. It had about 2000 tons bin capacity, using the old Gilbert screens for washing and Tyler electric impact screens for sand separation. This plant had a capacity of 2500 tons per day. This plant operated until about 1940, providing specification material in many sizes.

"The Stauffer plant, which replaced the old Utah plant, was built about 1000 ft. from the old location, and is probably one of the newest and most modern in the western part of the United States. It has a capacity of about 3000 tons per day. Ahead of the crushing plant is a scrubber which takes out about 60 or 70 percent of the minus ¼-in. which goes directly to a large dewaterer, the balance of the material going to the primary and secondary crushers and then to the classifying plant. Sand from the classifying plant goes to the dewaterer. This plant has the ability to make four or five sizes in one operation. It is completely electrified with semi-automatic controls. About one-half mile of conveyor belts of various sizes is used largely to convey material from the deposit to the plant. As the deposit is of hillside nature, it is excavated by hoist and slackline. This efficient plant is the result of 30 years experience."

Two other plants (railroad ballast) are operated by this company, one of which is the Evanston plant on the Union Pacific Railroad, described in ROCK PRODUCTS, July, 1941, p. 60. This plant produces 600 to 700 tons per hour of finished ballast and about an equal amount of sand which is wasted. Even larger capacity would be possible if shovel and truck capacity were added.

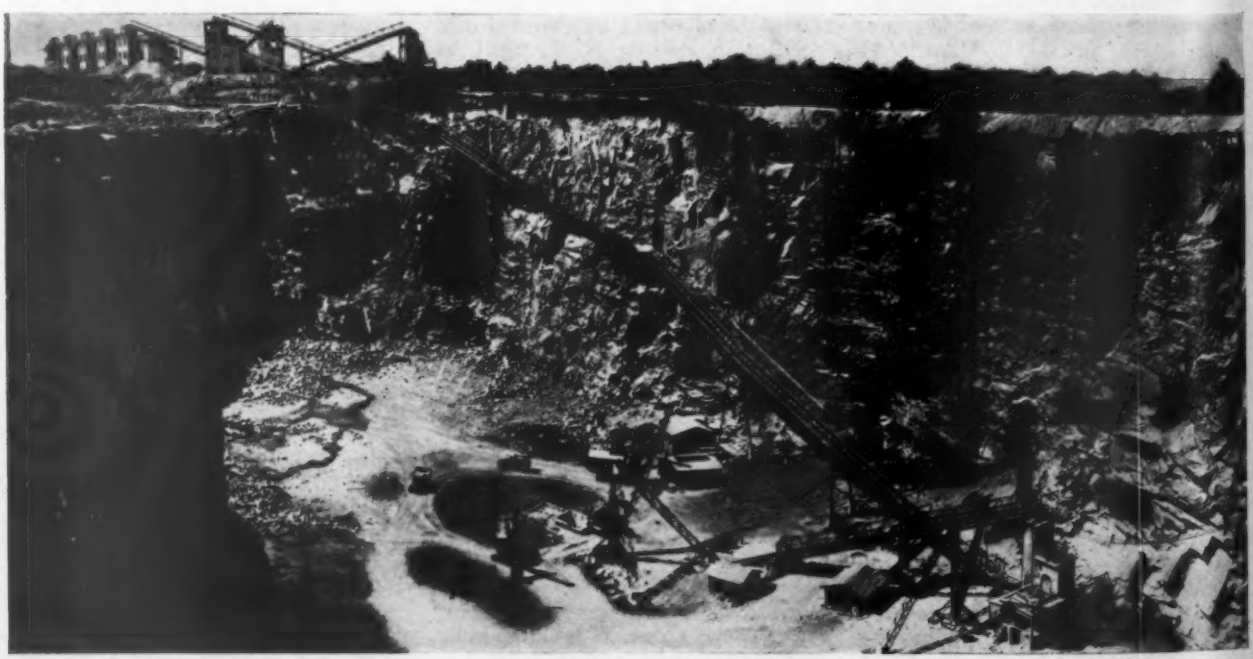
The Rockland plant on the Western Pacific is just being completed. The Sand Pass operation has been abandoned and some of the machinery in that plant is being used in the new Rockland plant, but it has been redesigned with considerable additional Diesel power added, crushing capacity has been increased, and screening capacity has been doubled over the Sand Pass operation. This new plant will have a capacity of 250 tons of ballast per hour. All the minus ⅜-in. sand will be wasted, which is about 350 tons per hour. Mr. Ryberg reports that this plant is the last word in modern equipment with automatic and semi-automatic facilities. Production has grown from 50 tons per day to about 10,000 tons per day.

Ready mixed concrete operations of this company started in 1936 with three 4½ cu. yd. Jaeger mixer units and a Johnson automatic plant which had been used on the Golden Gate Bridge job by Bates Rogers and is still in service. The bulk cement plant with Fuller-Kinyon loading equipment is now serving 12 units in this area. Another unit is being installed about 12 miles on the other side of the city with 150 cu. yd. capacity. This plant was furnished by Noble Co., Oakland, Calif. Trucks are all Macks or Whites. With the new installation, production will be 600 cu. yd. per hour in the two batch plants.

Slag Business Grows

HARRIS N. SNYDER, vice-president, The Buffalo Slag Co., gave some very interesting reminiscences of the early days of his company. "My entrance into the aggregate industry was 40 years ago June of this year, and started in stone. About two years later the company became interested in slag, and my own interest in it started in 1909, and it has been the principal interest since that time, although we engage in quarrying stone and producing sand and gravel.

"Forty years ago it was common in quarries to load stone by hand into relatively small cars. In most cases these cars were narrow gauge, and were propelled by a narrow gauge locomotive, usually steam. Crushing plants usually had a long incline extending to the quarry floor to which point cars were moved by locomotive, and then a cable was hooked onto the cars and they were pulled, by means of a hoist, up into the crushing plant, where they dumped their load directly into the crusher, the cars usually being of the end-dump type. Labor was paid about $1.25 per day, and the men that picked and loaded the stone were on a tonnage rate. I recall that the man who hooked the



Reinforced concrete structures of Palmetto Quarries Co. plant, above, and quarry (200-ft. face) with primary crusher, below, on quarry floor

cable to the cars received 75c a day.

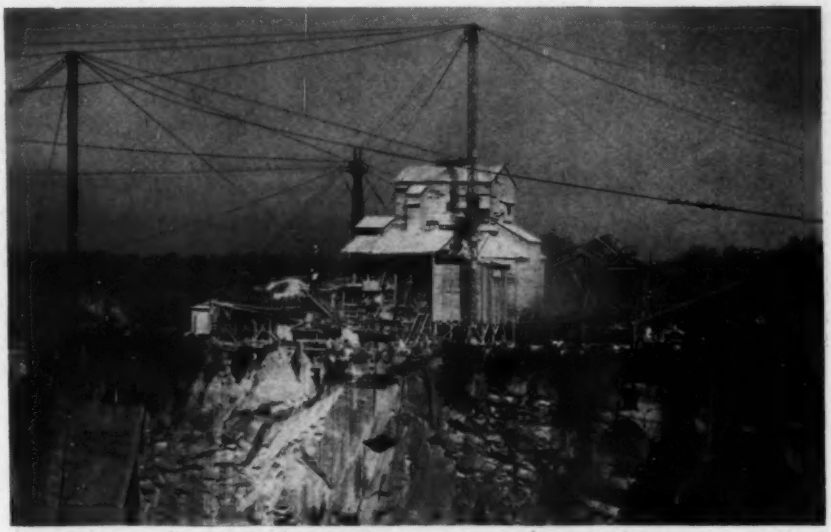
"Crushers were not particularly large as hand-picking of stone would limit the size that needed to be crushed. Not very long after this earliest recollection, the steam shovel was introduced into the quarries; larger crushers, including the roll type; screens were still the rotary type, but some experimentation with "knocker" screens was introduced. Later, of course, came the vibrating screens, high-speed crushers, gasoline and Diesel-powered machines for shovels, cranes and locomotives. Where the crushing plants formerly had been built of wood, they then graduated into either steel or reinforced concrete, or a combination of both, and some of them resembled 10-story sky scrapers in which were passenger and freight elevators.

"I sincerely believe that ROCK PRODUCTS had a large part in the progress made in the aggregate industry, and further than that their representatives, notably Nathan Rockwood, was on hand with good advice, rendering help with many of the industry's problems. I congratulate your publication on its 50th birthday, and believe that you will continue to serve this industry in years to come as faithfully and well as you have in the past."

Ballasting Contract Leads to Stone Business

JOHN RICE, chairman of the board, The General Crushed Stone Co., revealed some interesting high lights on the early history of his company which goes back over 50 years. "In the latter part of the last century we entered into a contract with the Lehigh Valley Railroad for ballasting from Newark to Buffalo. We hadn't the slightest thought of developing our operations into a crushed stone business, but in the first part of this century the highway development occurred and we were encouraged to develop the stone business in a more general line than just ballasting. We had three plants on the Lehigh Valley Railroad and one in New York City where we took the contract for excavation of the Jerome Park Reservoir for ballasting the New York Central Railroad. After discontinuance of that operation, we removed the plant to Rock Hill, Penn., on the Philadelphia and Reading.

"We then acquired a plant at Akron, N. Y., on the New York Central and, subsequently, purchased another plant in the same neighborhood which had a large contract with the Central for ballast. About the same time we acquired a plant on the Pennsylvania Railroad at Glen Mills, Penn., and prior to World War I, we opened up a plant at Little Falls and also one at Winchester, Mass. Subsequently, we acquired the plants of the Rock Cut Stone Co., at Auburn and Syracuse, N. Y., and are still operating the majority of all the plants aforementioned.



As the Palmetto Quarries Co. plant looked in 1920

"In the early part of this century our operations were all conducted by hand loading, and about this time we introduced steam shovels in some of the quarries. If I remember rightly, a No. 10 gyratory crusher was the largest in use at this time.

"In the year 1918, a dozen or more crushed stone interests got together in Chicago and formed a National Crushed Stone Association with the idea of developing a somewhat more stable business and one that would be generally recognized as worth while. This, as you well know, has developed into quite a powerful and useful organization."

Another veteran of this company, A. G. SEITZ, also commented on the early history of the organization and his part in it. "Just 53 years ago this month (April) the writer took a position as stenographer and clerk with a stone company, and with the exception of a few months during the depression of 1893 has been connected with the stone industry. This was with a company mainly producing flux stone.

"In those early days practically all work was done by hand labor, except that the drilling was done with tripod drills. Blasting was done with black powder and very little dynamite was used. Stone was broken by hand and loaded into one-horse carts, drawn to a dump and loaded into cars. At this time ground limestone also was produced by grinding with buhr mill stones. These were replaced with rock emery mills and later with hammer mills and other fine grinders. Travelling derricks were then installed, and stone was loaded by hand into buckets which were hoisted and dumped into cars.

"Then came stone crushers and a 12-in. crusher was installed along with 2-ton quarry cars with tracks and locomotives. This was replaced with an 18-in. crusher to increase capacity. Later came steam shovels and larger dump cars, locomotives, and crushers. The plant was very simple and was laid out mainly for producing flux stone and the small sizes were virtually a by-product.

"In 1911, the writer became associated with the commercial stone industry. This plant was using carts and horses to haul stone to the crushing plant. Well drilling had been installed to take the place of tripod drills. A change was made soon thereafter to cars and tracks, using mules and horses to haul the cars to the crusher. Later this system was replaced with steam shovels and larger quarry cars and locomotives.

"The plant was of the conventional type, using a primary breaker with several secondary crushers. Revolving screens were then in use, and the requirements were simple, only four sizes being required to meet the demand. After a few years of this operation it became apparent that changes must be made to meet the more exacting requirements. A larger primary crusher was installed and the plant rebuilt to meet the new requirements. The vibrating screens came on the market and changes were made by replacing the revolving screen with vibrating screens. Washing the product came along and washing equipment was installed in many plants. The demand for fine aggregate increased and it then became necessary to replace the old type crushers with the new type suitable for making fine aggregate. Cars and locomotives also began to be replaced with various types of trucks and trailer trucks.

"I would be remiss not to mention ROCK PRODUCTS. It has contrib-



Modern ready mixed concrete plant of Fort Worth Sand & Gravel Co., Inc., showing interesting array of different types of equipment. From left to right, mixer trucks, concrete pump, delivery truck, and mixermobile to elevate job mixed concrete on big projects

uted a great deal to the stone industry, and I would like to pay tribute to Mr. Rockwood for the work he has done for the stone industry."

Reinforced Concrete Crushed-Stone Plants

G. D. LOTT, president, Palmetto Quarries Co., Columbia, S. C., has an interesting story to tell about the development of his company from mule power to the construction of one of the most modern mechanized plants in the industry. "Organized in 1916, the original plant was driven with steam power with a No. 7½ McCully crusher as primary and a Gates No. 6 as secondary. An elevator, erected between the two crushers, delivered the crusher product to a 40-in. by 24 ft. revolving screen over the storage bins. Stone was loaded by hand in the quarry into 2-cu. yd. tram cars rolling on 30-in. track. Cars were pulled by a mule named Mike from the quarry to the foot of an incline leading to the primary crusher. Mike learned to make his round voluntarily without any driver. We made two sizes of stone called 2-in. and ¾-in. Capacity was five carloads in 10 hours.

"The plant was rebuilt in 1920 along the edge of the quarry, and it was electrified. Crushers were changed to 20-in. Superior McCully as a primary and a No. 6 style K Gates as a secondary, and a 60-in. by 20-ft. revolving screen was installed. Stone was still loaded in the quarry by hand and hoisted by two steel derricks of 15-ton capacity. Daily output was increased to 750 tons.

"In 1941, the plant was again rebuilt with reinforced concrete under the direction of E. Lee Heidenreich as consulting engineer. The 48x60-in. primary jaw crusher is now located on the floor of the quarry which is 200 ft. deep. Dump trucks loaded by two 2¼-cu. yd. electric shovels feed the crusher. A complete belt conveyor system carries the primary crusher product to secondary crushing and screening stations of reinforced concrete above with storage of finished sizes over a concrete tunnel. The plant now produces up to 300 tons per hour of finished products. The personnel of the organization is as follows: George D. Lott, president who has been on the job 30 years; George D. Lott, Jr., vice-president; Hamilton Lott, chief engineer; Sam C. Dreyfus, secretary and sales manager; and J. D. Ruff, superintendent." A complete article on this modern plant appeared in ROCK PRODUCTS, October, 1941, page 28.

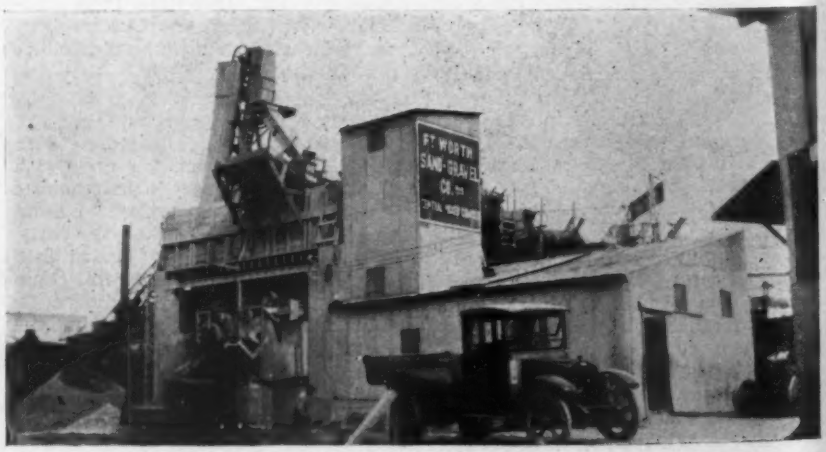
California Developments

ANSON S. BLAKE, president, Blake Brothers Co., Richmond, Calif., in his letter of congratulations mentioned some interesting history involving early California developments: "Our own company is 42 years old, but it is an outgrowth of the Oakland Paving Co., incorporated in 1870. This company installed a crushing plant to provide itself with material for the construction of water bound macadam. This continued to be its principal business for 35 years. When I went to work for them in 1891, a small proportion of its products was sold to the public for garden walks and for aggregates in concrete sidewalks. Concrete foundations were rare in Oakland. Brick was used for larger buildings and a 3-in. redwood mudsill sufficed for small houses. All cement in those days was imported from England and Belgium.

"In 1902 cement was made locally and a great impetus was given to concrete construction. During this decade the early experiments with California road oils were made, and by 1909 oil macadam pavements were being laid quite generally. This in turn, began the substitution of asphaltic macadams for the sand-asphalt sheet asphalt pavements that had been in use for a number of years. Each of these developments involved increasing demand for a larger proportion of fines, better gradings and more uniform products, which all old-timers will remember.

"Blake Brothers Co., got under way during this period of ferment. We were seeking a market to be served by water transportation, and were prospecting our present location at the time of the San Francisco fire in 1906. That clinched the determination to build the plant and to make it a commercial concern and not an adjunct to a contracting business. We have adhered to this policy for our 40 years of operation except that we do take contracts for rip-rap, sea wall and revetment work to sell those products. In addition to untreated quarry products we manufacture asphaltic concretes and ready mixed concrete.

"I am glad of the opportunity to



Old Central concrete mixing plant of Fort Worth Sand and Gravel Co., with aggregates plant in the background. Concrete was hauled to the job in ordinary truck bodies



View taken in 1892 of Missouri River dredge operated by Stewart-Peck Sand Co., now Stewart Sand & Material Co. In the first buggy in the black fedora is J. H. Doane and unidentified man; Mike Allen, holding horse; H. P. Stewart, in second buggy, and standing to the right, Capt. Webber

congratulate ROCK PRODUCTS for 50 years of superb service. Few industries have such an alert, understanding and forward looking trade journal. Your guidance of the industry through infancy and adolescence is good augury for continued and expanding usefulness."

Big Strides in Ready Mix

F. E. POPPLEWELL, vice-president and treasurer, Fort Worth Sand & Gravel Co., in commenting on his company's development made some interesting comparisons with ready mixed concrete operations and contributed several photographs, shown herewith, portraying the advances which have been made. The washing plant was built in 1921, and the mixing plant in 1922. "You will note," he said, "that the mixing plant has two mixers operating side by side with the cement house on the right, in which cement was received in sacks, as there was no delivery of bulk cement at that time. These sacks were emptied into an elevator boot, carried up to the proper height, and a screw conveyor moved the cement over to a measuring box above the mixer. The gravel in the early days was not weighed, but was measured in a box mounted on a shaft which the operator could tilt to the mixer. In 1922, practically all of our concrete was made with pit run gravel and seldom was accurately measured, until we did this with boxes. Now, however, it is made with washed material which is weighed with allowances for moisture, the cement is weighed, and the delivery equipment has changed from the small solid-tired vehicle to the large truck mixer.

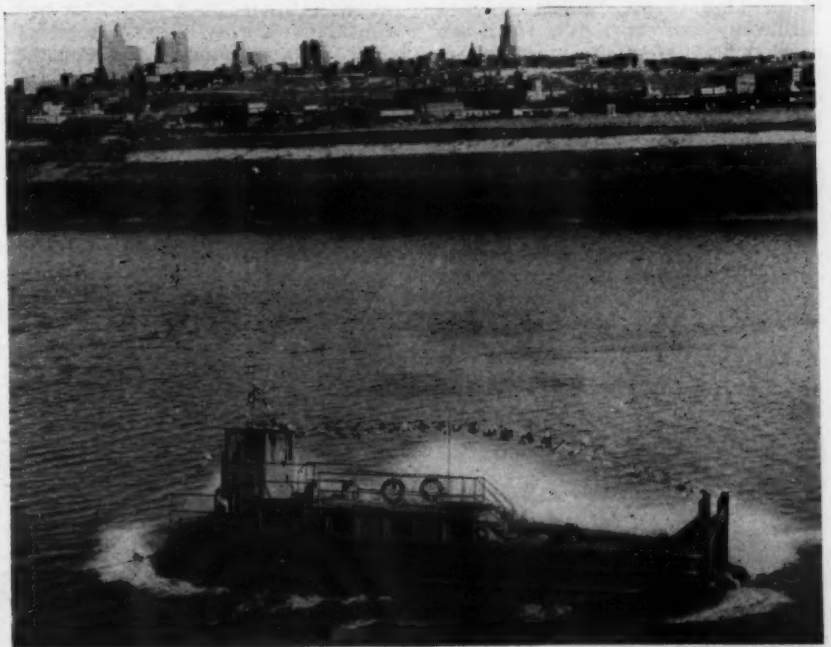
"In the early days the pit run gravel was so clean that all we had was a flume to carry the water and gravel over gravity screens for separations, and our sand was allowed to settle in a wooden bin where the water drained out and left no clay deposit. In 1926, a plant was built with a concrete base and supporting piers with sufficient headroom to load either cars or trucks. It was equipped with a scalping screen, trommel screen with scrubber, and the sand was reclaimed through sand-settling tanks. The comparatively new Quigley plant, described in ROCK PRODUCTS, together with portable equipment, is now used for gravel production. Of course, you suggest that I have not been in the industry 50 years (but sometimes I feel like it)."

New Specifications Change Methods

JOHN PRINCE, president, Stewart Sand & Material Co., Kansas City, Mo., recalls the great changes made in methods and materials during the past 50 years in his letter:

"The first that seems most important to us in this area came with the development of specifications for aggregate. In this area we first became seriously conscious of specifications with development of the state highway program in the early 20's. Prior to that time sand was sand. It was either clean or dirty, fine or coarse, without any measurements to indicate what these terms meant. The inspector looked at it, felt of it, and that was that. Looking back to the screen analysis of some sand produced by us in 1918, it is evident that much of it would not be used today.

"It was during the early 20's that methods were developed, testing apparatus installed, so that a better product could be maintained. Developments of specifications are still going on, and particularly in sand the more recent specifications coming from governmental agencies include close grading on a number of sieves and the requirements for percentages passing 100 mesh sieve. This indicates



Launching tow boat "John Prince," a converted L. C. M., equipped with two 225-h.p. Diesel engines. Stewart Sand & Material Co. will operate boat on Missouri River. In the picture the Kaw River is seen in the foreground with Kansas City in the background

that we have not yet reached the end of the story.

"Specifications concerning crushed stone, the coarse aggregate used in this area, have had a similar development. As they have affected the industry those specifications relating to durability have probably had a greater impact than those relating to grading.

"The second important change in the industry as we experienced it, was the development of the pneumatic tires for such use. In the early 20's most of our trucks were equipped with solid tires and to protect the trucks it was necessary to establish a speed limit of 10 to 15 miles an hour. In the late 20's large trucks equipped with pneumatic tires handling from 6 to 12 tons per load became available, and the only speed limit was that established by the cities and states through which the trucks passed. Before that time this company had in operation at least fifty railroad dump cars owned by the company. These cars were used for delivery of sand from the producing points to a number of yards throughout Greater Kansas City. With the advent of the high speed truck, both the cars and the yards became obsolete and most deliveries to much greater distances are made by trucks.

"This company has been in operation more than 50 years (about half of that without my help). Until 1925 the company was engaged in the production and delivery of sand only. Until 1925 the only delivery equipment was teams with wagon. One of the illustrations shows an operation of this kind in 1895. In this area and within my own experience, these two developments seem the most important."

H. D. BELLAMY, chairman of the board, Concrete Materials and Construction Co., Cedar Rapids, Iowa, in offering his congratulations, made the following comments covering his company's outstanding progress in the industry. "It has now been 40 years since the writer first became interested in aggregate production in 1906, and it seems to him that a copy



An example of the more recently built plants of Concrete Materials and Construction Co., at Correctionville, Iowa, built in 1937. Recent construction is all steel

of ROCK PRODUCTS has been on his desk almost from the beginning.

"What's ahead of us? We would answer that question by stating that a lot of construction is badly needed in today's world. The volume should be very large unless costs become prohibitive. So far, our products are selling generally at pre-war levels. No part of present day inflated building costs can be charged to us. A reasonable advance in aggregate prices is today more than justified. Such an increase, coupled with the current and the future potential demand, should insure a reasonable profit to the industry for a number of years to come.

"In that same period, we are confident that ROCK PRODUCTS will concontinue to tell an interesting story of aggregate production. It will continue to tell of improved methods and equipment, and will ever be a publication of value to every producer in the industry. Best wishes for your continued success."

S. P. MOORE, president of Concrete Materials and Construction Co., writes, "I am very pleased indeed to offer my congratulations to ROCK PRODUCTS on its 50th anniversary. In the number of years I have been engaged in the aggregate business it has been of great service. Your publication always has taken a forward stand for better things for the industry, and I sincerely believe the industry owes your publication and your personnel many thanks for the service rendered. I sincerely wish you continued success."

G. A. AUSTIN, president of Consolidated Quarries Corporation, Decatur, Ga., and also president of the National Crushed Stone Association, has the following confident and reassuring message for the future.

"In commenting on the progress of the crushed stone industry over the past fifty years, I bow to those whose personal experiences carry more weight. Management and labor have done their full share in promoting our progress but alone could not have reached the present day high operating efficiency and improvement in physical characteristics of our products. Through initiative, research, and better presentation the manufacturers of materials and equipment used in our industry have made it possible for progressive producers to improve all phases of their operations."

"Step by step our flow sheets either reflect the rapid strides made by those concerned with our industry or still hold opportunities for us to participate in overall improvements of processes and products. No longer are aggregate producers widely separated. The annihilation of time and space by numerous scientific developments has brought us in close contact."

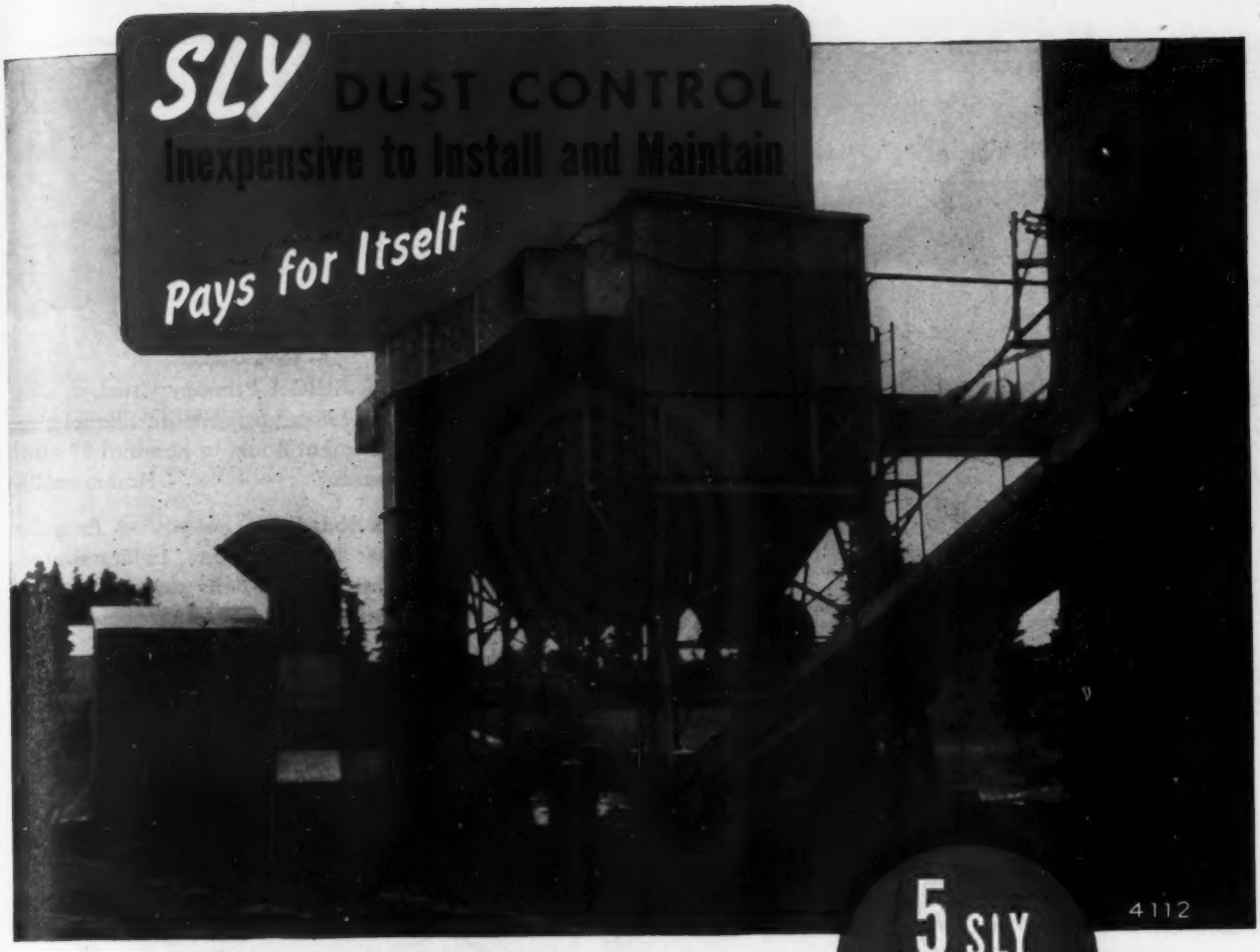
"The many opportunities afforded by trade associations for the wholesome and informative interchange of ideas and experience among members has been an important factor in the advancement in our industry. The dissemination of information through the columns of our progressive trade magazines has stimulated our thinking, and the broader distribution of these magazines among our key men has been the source of many new ideas."

"Our business has indeed undergone astounding changes. While we are still primarily concerned with the making of little ones out of big ones, we know from retrospection that it will continue to take inspiration and

(Continued on page 122)



One of the first plants of Concrete Materials and Construction Co., built in 1912 in southern Iowa. Note the crude sand screening and settling methods and equipment of that day



Sly Dust Filter used in connection with the crushing plant of the Staso Milling Co., Kremlin, Wis., manufacturers of roofing granules.

Sly Systems are widely used to control dust generated in such operations as crushing, grinding, screening, conveying, loading, separating, and mixing—in connection with production of cement, crushed stone, agricultural limestone, gypsum, asbestos, talc, feldspar, fluorspar, gold, copper and iron ore, diatomaceous earth, bauxite, etc.

These units are not expensive either to install or maintain. They save thousands of dollars yearly in plant maintenance and improved production, also in the recovery of valuable materials—often repaying their cost in a comparatively short time.

Ask for Bulletin 98, a 20-page illustrated publication giving important information about dust control and the advantages of the Sly method.

Sly Dust Collectors are different—they get all the dust by filtration through cloth. Over 5,000 installations.

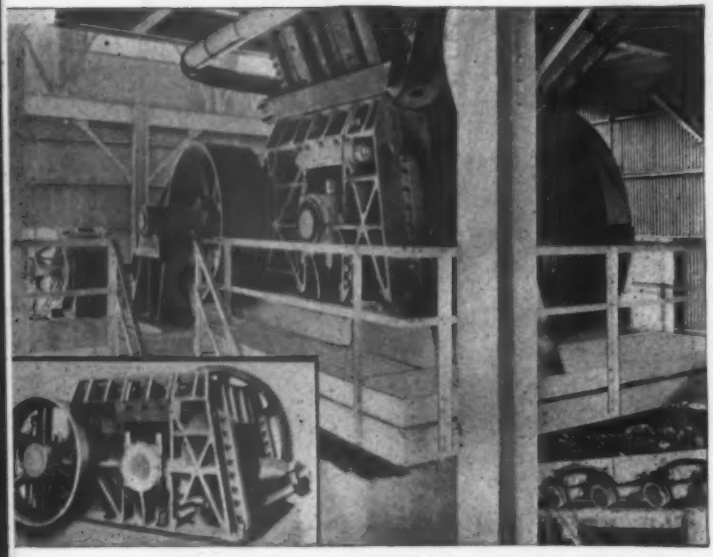
5 SLY SUPERIORITIES

1. **Greater filtering capacity because of more filtering cloth.**
2. **Taut bags (patented) save power and improve dust removal.**
3. **Bags more easily replaced.**
4. **Automatic control (any degree) minimizes or entirely removes the human factor.**
5. **Simpler shaker mechanism results in savings in maintenance and operation.**

SLY
INDUSTRIAL DUST CONTROL

THE W. W. SLY MANUFACTURING CO.
4746 TRAIN AVENUE • CLEVELAND 2, OHIO

"PENNSYLVANIA"



PENN-LEHIGH
Primary Crushers

Since 1929 this PENN-LEHIGH Primary Crusher, size 36" x 60", has been reducing large Steam Shovel size hard Limestone and Cement Rock, to nominal 8" size, for feed to "Pennsylvania" STEELBUILT Hammermill.

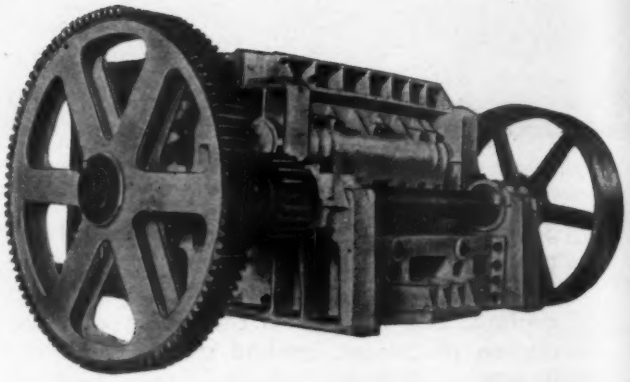
During the 17-year period, this STEELBUILT Primary has crushed well over 9,000,000 tons, before requiring replacements, other than V-Belts and occasional welding for restoration of tooth contours.

Six (6) sizes. Capacity range 200 to 800 tons hourly.

SERVICE

After 19 years of low-cost, trouble-free service from their PENN-LEHIGH Primary, a leading manufacturer ordered a duplicate unit for installation in a second plant—and this year their third PENN-LEHIGH will go into still harder service.

These carefully considered designs, liberally carried out in massive STEELBUILT construction, with ample provision for automatic tramp iron protection—build up production records, which are the real basis for repeat orders.





ARMORWELD
Secondary Crushers

Heavy welded steel unit frame construction, powerful Toggle Release tramp iron protection, and quick adjustment for product sizing and wear compensation, enable ARMORWELDS to render heavy secondary, low-cost service on Limestone, Gypsum, Shale, Industrial Minerals and Ores.

Six (6) sizes. Capacity range 100 to 300 tons hourly.



Reproduction of our first advertisement in ROCK PRODUCTS, which appeared in the June 22, 1910, issue.

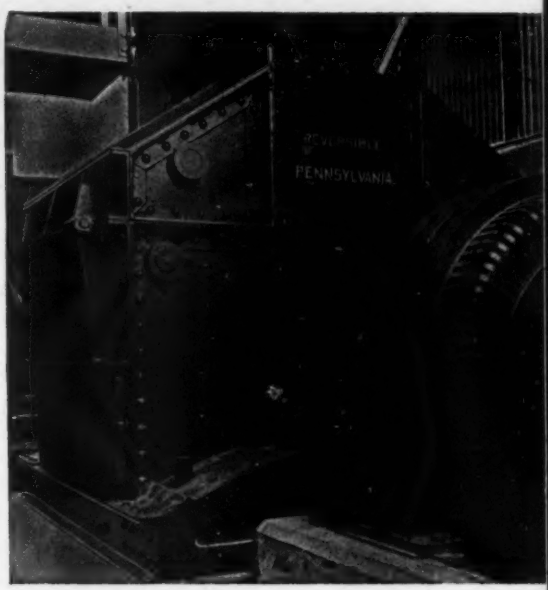
After 38 years of continuous service eight (8) of these early STEELBUILT Hammermills (approx. weight 7 tons each), are still in daily operation with one Company, while others continue to do their job in various Industries.

PENNSYLVANIA REVERSIBLE HAMMERMILLS

During the period between 1908 and 1937, the quality and efficiency of "Pennsylvania" STEELBUILT Hammermills was steadily improved, distribution became world-wide, and the advanced REVERSIBLE type was developed and introduced.

After an exhaustive survey, the Purchaser of the eight (8) Hammermills, above mentioned, selected this "Pennsylvania" REVERSIBLE Hammermill (approx. weight 48 tons), for reducing the hard Limestone output of a large Gyratory, from nominal 8" to nominal 1" size, at the rate of 500 to 600 tons hourly.

The REVERSIBLE Series includes twelve (12) sizes with a capacity range of 50 to 700 tons hourly, to meet the requirements of small, medium and large plants.





PENNSYLVANIA REVERSIBLE IMPACTORS

For secondary reductions of Cement-making Materials, and more abrasive Minerals and Ores, "Pennsylvania" STEELBUILT REVERSIBLE Impactors, which crush by smashing impact, without cage attrition, provide notably improved product shape and uniformity, at lower cost and power demand.

Symmetrical wear, resulting from alternate right and left-hand operation, largely extend the life of the working parts.

Our Laboratory tests closely approximate commercial results.

We extend congratulations to ROCK PRODUCTS for 50 years of outstanding service to Operators and Manufacturers.

GENERAL OFFICES
Liberty Trust Building, Philadelphia
Representatives in Principal Cities
"Penncrush" Philadelphia

PENNSYLVANIA CRUSHER COMPANY
Cable Addresses

Associated with
Fraser & Chalmers Eng. Wks., London
Offices throughout the world
"Vanser" London

STEELBUILT CRUSHERS



E. J. Krause

(Continued from page 118)

perspiration to keep pace with the rest of the industrial world. As we approach the day when we may shatter rock with atomic energy or measure output with an electric eye, it is comforting to know that we number among those in, and allied with our industry, men with experience and vision to guide us through the difficult times ahead and to assure our continued progress.

"High among our leaders are the men who have made ROCK PRODUCTS an outstanding trade magazine. May their accomplishments of the past fifty years be a forerunner of what we may expect in the years to come."

Thirty Years' Promotion of Agricultural Limestone

E. J. KRAUSE, president of Columbia Quarry Co., St. Louis, Mo., and a past president and director of the National Crushed Stone Association, commented briefly on the development of his concern into one of the nation's largest and most progressive crushed stone businesses, as follows:

"I organized this company and incorporated it in September, 1906, and have been in active charge of the company ever since. We started out with a little quarry operation with a production of 16 tons per day. A rather crude railroad ballast was produced and our equipment consisted of two dump carts hauled by mules, a No. 3 Gates crusher and flat bar screen. Soon, we built a new plant designed by Allis-Chalmers which was burned. Another was built, which also burned in 1924, and a fireproof plant was then erected.

"We now have four quarries. One, at Krause, Ill., is served by the Columbia and Millstadt railroad, owned by myself, my two sons and an associate, which connects with the G. M. & O. Railroad and by the Missouri Pacific and Illinois Central lines. This plant turns out agricultural limestone, crushed stone for concrete construction and rip-rap. Another plant, at Valmeyer, Ill., a mining operation, produces chemical and metallurgical grade limestone of high purity and has a fine grinding plant in connection. The Prairie du Rocher, Ill., plant produces calcium products for various industries as well as mineral foods for animal feeding, and the fourth plant is at Elsberry, Mo. Total capacity is 12,000 tons daily.

"Agricultural limestone has been my hobby and special interest for 30 years and, so far as I know, my company was the first to put out with regularity literature written by agricultural experts—all college men—until today we believe we are the largest producers of agricultural limestone in the United States."

Much of the early history and development of this concern, which incidentally was one of the very first to operate a Cyclone well drill, was covered in an article in the April, 1945, issue of ROCK PRODUCTS.



Modern Steelton quarry plant of Bethlehem Steel Co., as it appeared in 1934, showing semi-trailer truck dumping stone into primary crusher, conveyor to screen house, and finally conveyor to the washing plant

Science in Flux Stone Business

M. L. JACOBS, vice-president, Bethlehem Steel Co., Bethlehem, Penn., comments as follows: "May I congratulate you on your 50th anniversary, and also for producing a magazine so useful to the stone trade. While ROCK PRODUCTS is celebrating its 50th anniversary, I will be celebrating my 30th anniversary in the quarry business. Of course, I was connected with rock work prior to 1916, but it was in that year that I took over the management of the quarries for the Bethlehem Steel Co. At that time Bethlehem had only a couple of small quarries producing under 400,000 tons of stone per year. Today, the company has five quarries with modern equipment and is able to produce over 5,000,000 tons

(Continued on page 142)



Old plant at Steelton quarry of Bethlehem Steel Co., as it looked in 1919. Stone truck and horse for pulling it may be seen in right foreground

SOLUTION to your Crushing Problem!





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DUST CONTROL
Important N. I. S. A. Topic

National Industrial Sand Association convention at Hot Springs, Va., draws record attendance

THE eleventh annual meeting of the National Industrial Sand Association, held at The Homestead, Hot Springs, Va., May 15 and 16, had the largest attendance in the history of the Association. Forty members and speakers attended the business sessions and 25 wives made the trip to enjoy special social activities prepared for them. The final afternoon was devoted to a golf tournament for members and wives.

A full program was crowded into the three business sessions, with featured speakers on the subjects of dust control, price control and legal matters relating to industrial health. The transaction of Association business matters; reports of the various committees; discussion of pressing industry problems; and the election of officers completed the program. The Association will meet again at Hot Springs, Va., May 14 and 15, 1947, and has scheduled a Fall meeting in October, 1946, at the Edgewater Beach Hotel in Chicago.

New Officers

A. Y. GREGORY, Whitehead Bros. Co., New York, N. Y., was elected president, succeeding T. C. Matthews, Pennsylvania Glass Sand Corp., Lewistown, Penn., who was extended a rising vote of thanks for his able handling of Association responsibilities over the past two years. GEORGE A. THORNTON, Ottawa Silica Co., Ottawa, Ill., was elected vice-president and STERLING N. FARMER, Sand Products Corp., Cleveland, Ohio, treasurer. The Board of Directors is comprised of, in addition to the officers and past presidents who are ex-officio members, HAMILTON ALLPORT, Chicago, Ill.; E. M. DURSTINE, Columbus, Ohio; C. M. HARDY, Evansville, Ind.; W. J. MUHLITNER, Detroit, Mich.; C. R. WOLF, Millville, N. J.; and J. S. CABLE, Akron, Ohio.

President Matthews, in calling the convention to order, expressed enthusiasm at the attendance and commented briefly on the industrial sand industry's notable contribution to the war effort. The industry far surpassed its objectives in production for war, he said, yet was not compelled to ask government assistance or financing for new plant capacity. He mentioned some of the serious problems that confront the industry ahead, and concluded with the prediction that those problems would be satisfactorily solved just as the war production goals were met.

Industrial Health

THEODORE C. WATERS, association counsel, in his report on Association activities dealing with the legal matters relating to industrial health, confined his remarks principally to developments of very recent occurrence. He discussed State Codes of industrial hygiene, the aluminum therapy treatment for silicosis and compensation insurance rates.

In commenting on state codes, he said that various state departments have been increasing their activities and that the United States Public Health Service was preparing the draft of a model set of rules and regulations for the control of industrial hazards, to be submitted to State Departments of Health for consideration and adoption. The draft probably will be introduced during 1946.

Mr. Waters commented at considerable length on the proposed industrial code recently prepared by the Ohio Department of Health and the work that had been done in behalf of the industry by Mr. Theodore F. Hatch, Industrial Hygiene Foundation, and others, to see that provisions applicable to the control of silicosis were reasonable and practicable. Certain provisions in the proposed code, objectionable to the industry, were amended as a result. In its original form, for example, the code would have made mandatory the substitution of non-injurious substances or those having lesser hazards for substances having greater hazards. This provision, probably the first in any state requiring substitution, was deleted.

Amendment to this code suggested by Mr. Hatch, and accepted, provided that the maximum allowable concentrations should be related to an 8-hr. daily exposure; that in determining exposures three atmospheric samples should be collected in the breathing zone of the worker, spaced at intervals to yield an average measurement of exposure; that



A. Y. Gregory, new president, N. I. S. A.

for the purpose of determining allowable concentrations for silica the percentage of free silica, smaller than five microns, should be the criterion. Mr. Hatch, according to Mr. Waters, believes that the limitation of five million particles per cu. ft. of air is practicable of attainment.

The Ohio code will become effective January 1, 1947. Mr. Waters suggested that Ohio producers would find it good business to determine their degree of compliance in order to take steps necessary for installation of equipment to attain the permissible silica concentrations.

He also mentioned the proposed industrial hygiene code prepared by the New Jersey Department of Labor which is somewhat similar to the Ohio code. Mr. Waters expressed appreciation for the assistance of Mr. Hatch and R. G. Hay, Zanesville, Ohio, toward securing amendments to these codes of benefit to the entire industry.

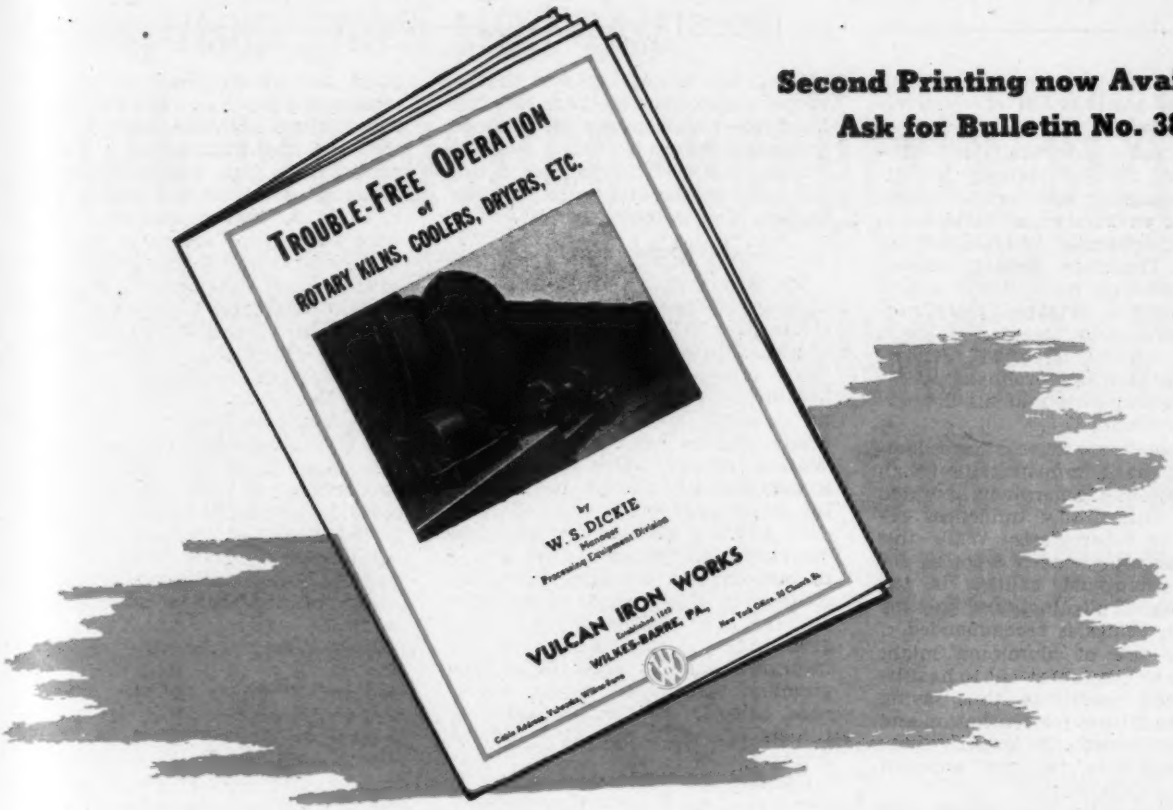
Aluminum Therapy

In commenting on aluminum therapy for treatment of silicosis, Mr. Waters quoted from a published report authorized by the Council on Industrial Health and the Council on Pharmacy and Chemistry of the American Medical Association. It read as follows:

"The dissemination of reports on the effects of aluminum powder in the prevention and treatment of silicosis has aroused widespread interest and a demand for an authoritative statement regarding its value. At the present time the following statement would seem to be warranted; it is subject, however, to such modification as future knowledge and experience may indicate.

"1. In experimental animals the *prophylactic* use of aluminum in-

(Continued on page 126)



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(Continued from page 124)

hibits the toxic action of relatively pure quartz.

"2. In man, industrial dust exposures often involve mixtures of various minerals in addition to quartz and other environmental variables to which experimental animals are not subject. Therefore, human silicosis usually develops more slowly and is often modified in type. Only prolonged unbiased observation, with adequate control cases, will demonstrate whether the prophylactic results obtained with animals are applicable to man.

"3. Animal experiments have demonstrated that administration of high concentrations of amorphous hydrated alumina unfavorably influences resistance to tuberculosis. While this result has not yet been reported for metallic aluminum, caution in the application of all aluminum therapy to human beings is recommended.

"4. The use of aluminum might appear as an easy short-cut to healthful working conditions, thus saving large expenditures for ventilation and other control methods. Actually there is no substitute for the accepted methods of dust control.

"5. If industry indiscriminately treats all employees with aluminum dust, there may be aggravation of tuberculosis or other pulmonary conditions.

"6. The *therapeutic* use of aluminum in man appears to relieve symptoms in a very small number of cases in which silicosis develops rapidly. Experience in some groups is more favorable than in others.

"7. In view of these considerations it is recommended that the general application of aluminum therapy in industry be delayed until adequately and impartially controlled clinical observation demonstrates its effectiveness in preventing or alleviating silicosis in man. In the meantime, there should be no slackening in the control measures that have been found effective in reducing the incidence of dust diseases in industry."

Mr. Waters mentioned that it had been suggested to a member company by a customer that metallic aluminum powder or amorphous hydrated alumina should be added to pulverized silica for the prevention of a silicosis hazard in the use of the product. Dr. Gardner of the Saranac Laboratory, when asked to comment, said:

1. That the use of such a proposed mixture should not be used where employees exposed would have active tuberculosis.

2. That animal experiments would indicate that such a mixture would inhibit the development of silicosis.

3. That there were many practical problems that would have to be solved for the handling of the mixture.

In closing his discussion of this subject, Mr. Waters stressed that by proper engineering methods safe limits of concentrations may be obtained, and he recommended that it would be far better to solve the problem in that way than by the attempted administration of aluminum therapy.

Insurance Rates

Mr. Waters reviewed meetings with high executives of stock insurance carriers for the purpose of discussion of insurance rates applicable to silica risks. A reduction of rates more in line with the experience of the industry is sought and thus far little has been done in that direction. Mr. Waters cited the rates applicable in Illinois and New Jersey to illustrate the unreasonableness of rates presently effective for silica grinding. The overriding occupational disease rate in addition to the base workmen's compensation rate is $4.59 per $100 of payroll in Illinois and $2.45 per $100 in New Jersey. Records of the insurance carriers indicate a pure premium based upon actual experience, of $0.35 per $100 of payroll in Illinois and $0.22 per $100 in New Jersey.

Carriers are not inclined to recommend substantial reductions because they are apprehensive of a flood of claims in event of an industrial depression, income premium volume is small and they do not want to carry this type of risk in any event. The Association is now planning definite steps to take action for adjustment in premiums. In concluding Mr. Waters urged that the industry reconsider from time to time the subject of industrial hygiene and determine whether or not everything is being done to protect the health of its workers.

Plant Dust Control

THEODORE F. HATCH, Industrial Hygiene Foundation, who is considered an outstanding authority on the plant production phase of silicosis, presented a paper on "The Dust Problem in Sand Manufacture." He said that the important problem in connection with dust was in convincing industry that a hazard existed, that it could be defined and that there were economical means of bringing it under control. Lack of facts has been the main obstacle in the past, he said, and there is now a demand for objective study and evaluation of working conditions. No industry in which exposure to quartz dust is a continuous part of daily operation can afford not to institute the necessary control measures, he emphasized.

In commenting on the new codes, particularly the Ohio and New Jersey codes, he pointed out that they specify the degree of control but do not regulate the methods of control to be employed. A maximum average exposure of five million particles per cu. ft. is required for dusts containing over 40 percent free silica, ten million for 20 to 40 percent concentration and 20 million for 10 to 20 percent contained free silica. Mr. Hatch believes the five million particle level is attainable, although not easily or cheaply. The total experience in the industry on dust control methods is of far more value than that of any single plant and, in his opinion, should be evaluated and made available to all.

The Industrial Hygiene Foundation provides a technical center for just such studies by member companies, he said, and he suggested that the industrial sand industry through its Association undertake a joint study of its dust problem, working through the Foundation and an advisory technical committee of the Association. All pertinent facts relating to dust control in plant operation would become objectives of the study, leading to preparation of a manual of good practice for the industry which would

(Continued on page 138)



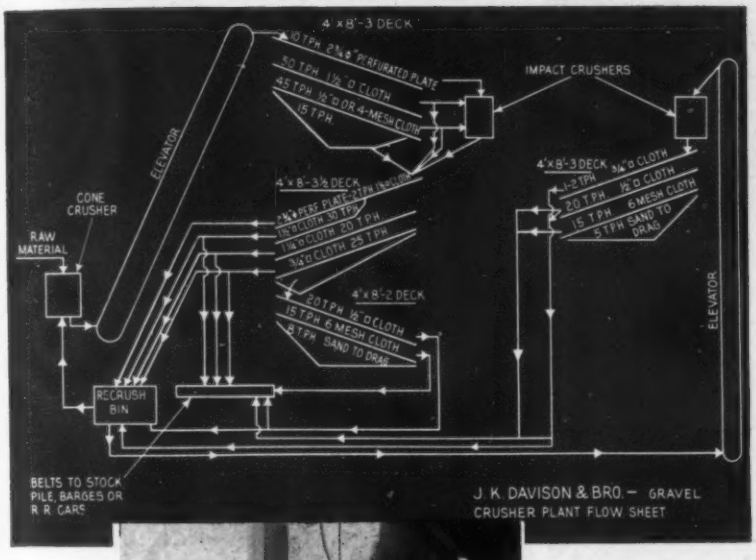
George F. Pettinos, Inc., foundry sand exhibit at recent convention of American Foundrymen in Cleveland. In the foreground may be seen Gene Autry, movie and radio star visitor, standing in between George Pettinos and Ralph Swank, son of Hiram Swank, refractory manufacturer. In the background are sales representatives of the company in Canada and the United States

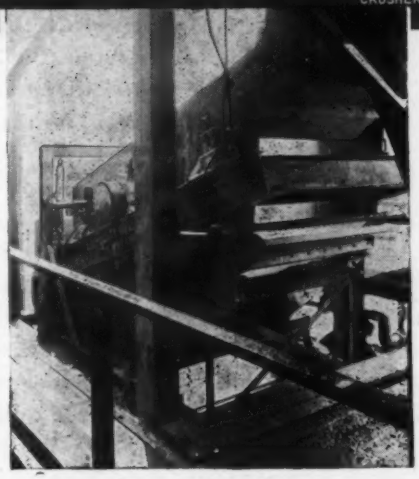
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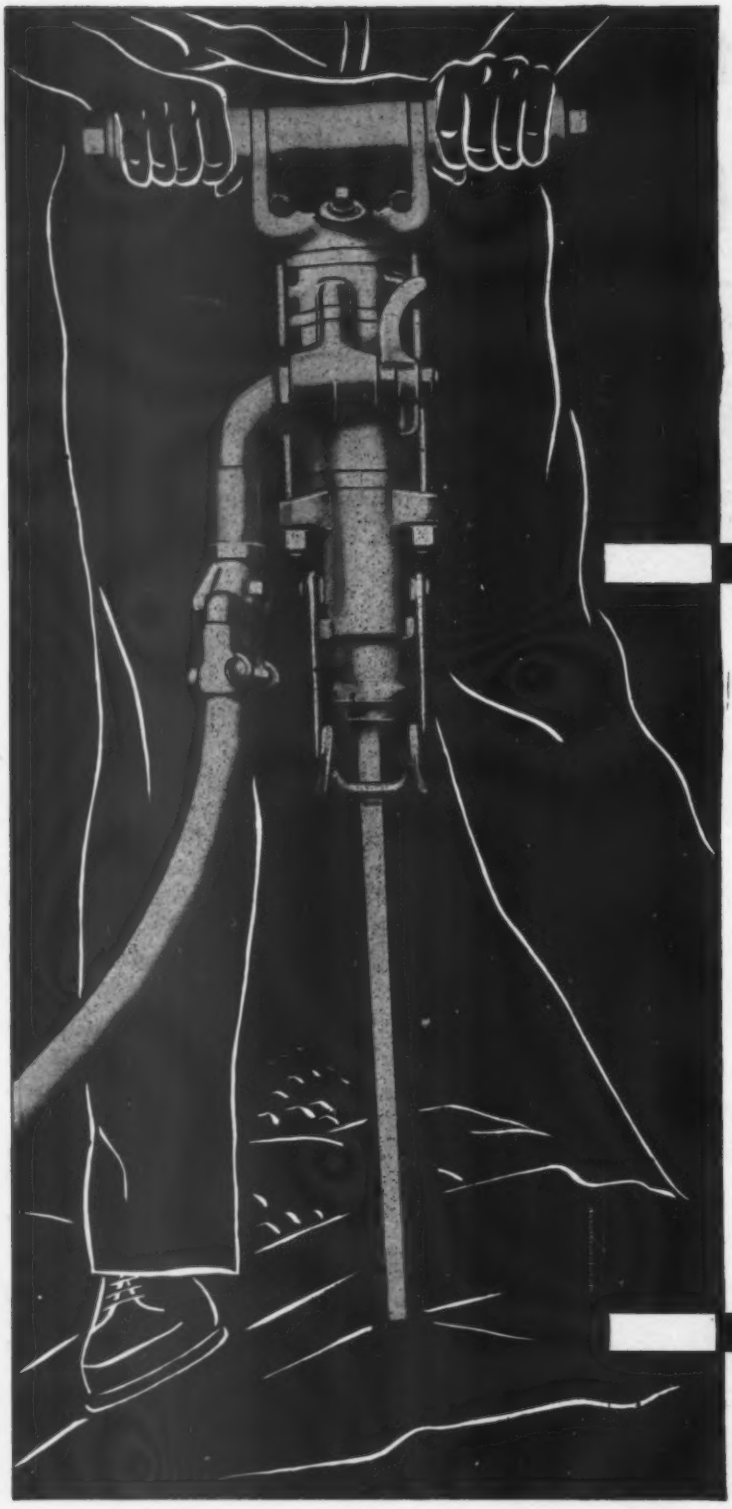
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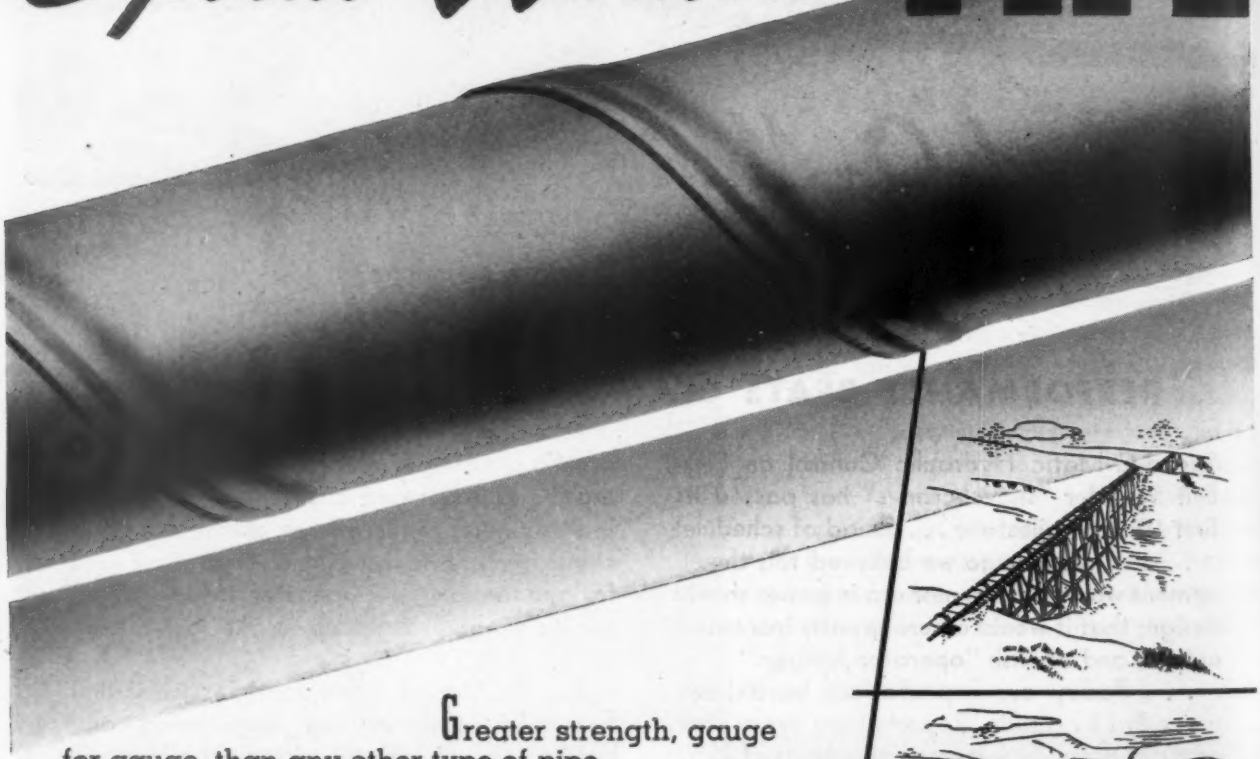
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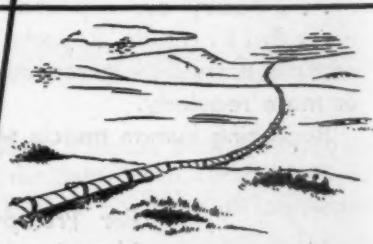
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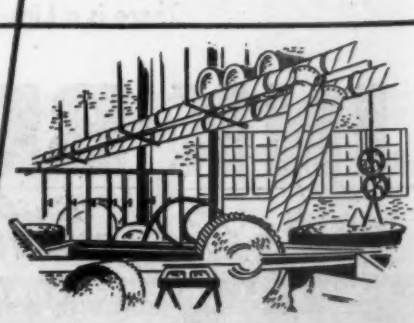
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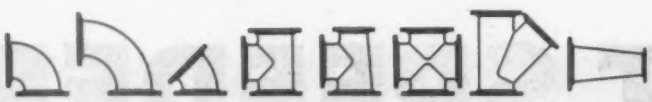




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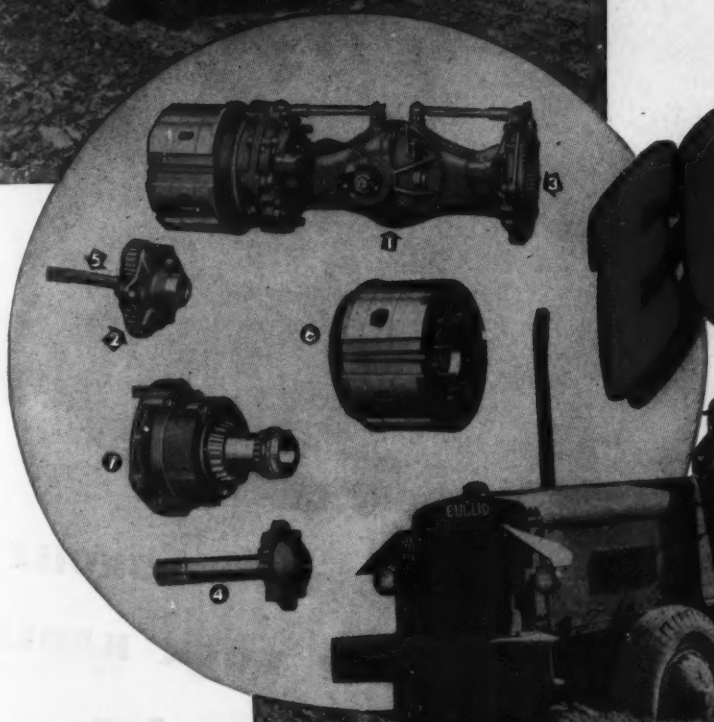
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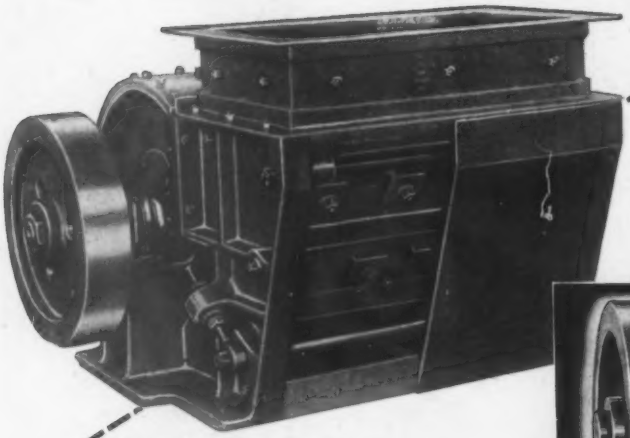
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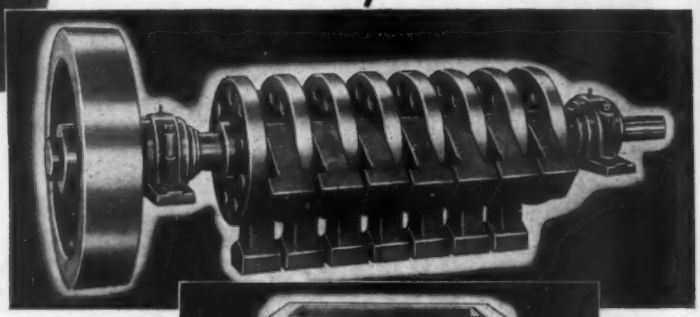
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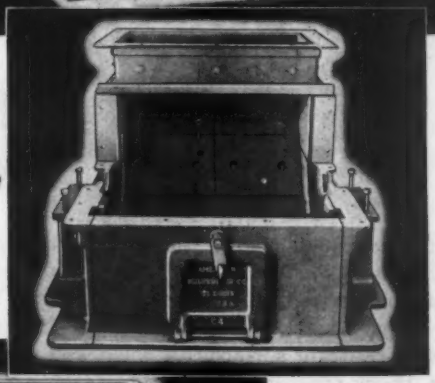
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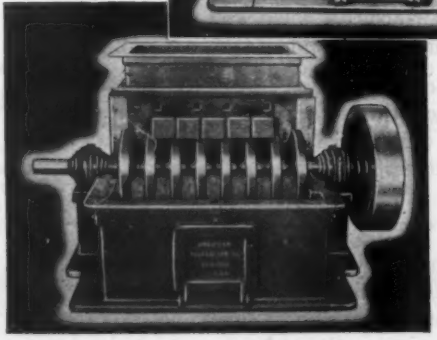


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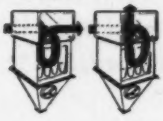
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Because its exclusive vane design and small diameter tubes generate higher centrifugal forces, the Multiclone recovers a large percentage of even the very fine particles 10 microns and less as well as the heavier particles. Multiclone's high recovery of both small and large particles means high overall collecting efficiency.

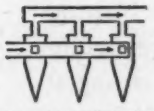
POINT 3—It is Unusually Adaptable!

In addition to the shape adaptability outlined above, Multiclone's inlet-outlet connections are also readily adaptable to plant restrictions. Where headroom is low, install the Multiclone with side-inlet, side-outlet. Where side clearances are small, use side-inlet, top-outlet arrangement. Or still other arrangements are possible!

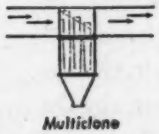


POINT 4—It is Simple!

Both installation and maintenance of the Multiclone are unusually simple. For example, the Multiclone requires only a *single* inlet and a *single* outlet duct compared with the complicated multiple ducts of conventional cyclones. This not only saves space—but is simpler and cheaper to install and insulate. Moreover, the Multiclone has no filters to replace, no high-speed moving parts to maintain, nothing to require frequent cleaning or repair... and a *single* collecting hopper serves many tubes!



Conventional Cyclone



Multiclone



POINT 5—Still Other Advantages!

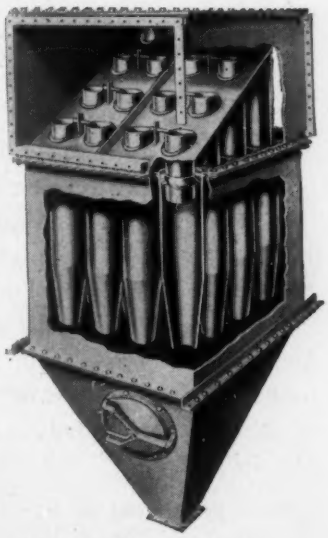
The above advantages are by no means the complete story on Multiclone savings. Get *all* the facts before you decide on any recovery installation.

Send for this Multiclone booklet!

COTTRELL PRECIPITATORS · MULTICLONE COLLECTORS · TURBULAIRE SPRAY DRYERS

CHECK over the multiple Multiclone advantages outlined at left. They broadly indicate how Multiclone recovery equipment saves space... cuts installation costs ... boosts recovery efficiency... minimizes maintenance... and makes many other vital savings.

Then consider this fact... Any *one* of these advantages is sufficiently important in itself to make Multiclone equipment the logical choice for your recovery operations. But when you realize that the Multiclone offers definite, clear-cut advantages on *every* qualification essential to maximum efficiency and economy in recovery operations you have some idea of the far-reaching savings you will make by installing Multiclone.

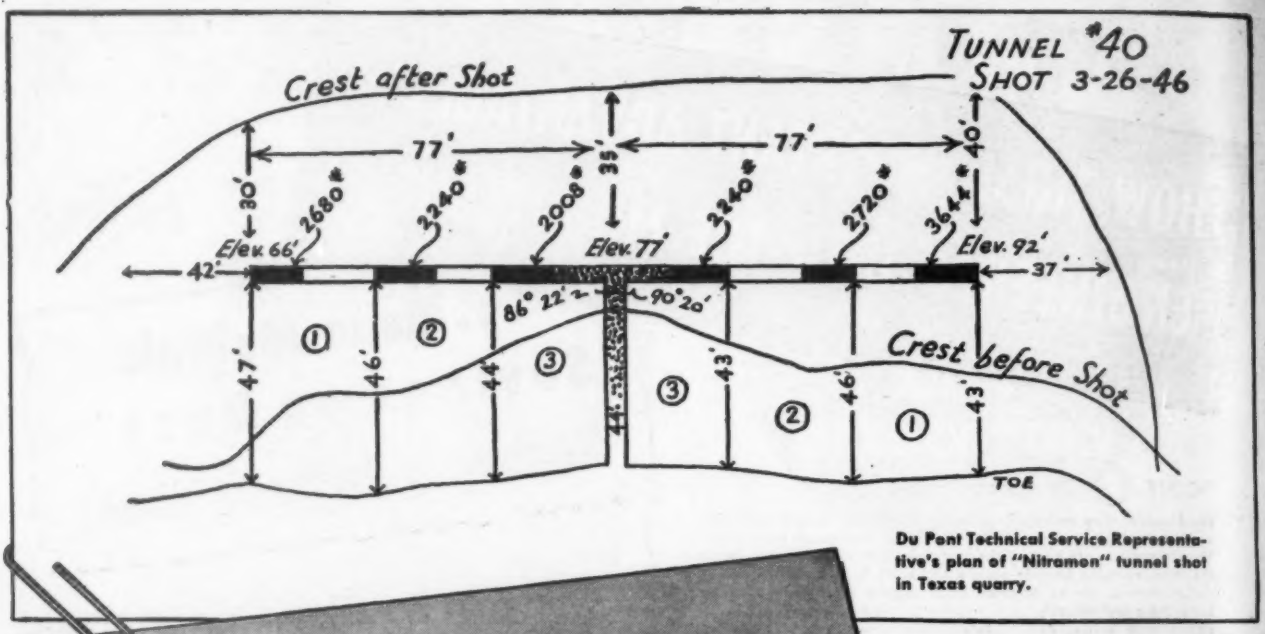


Let us give you further information on Multiclone recovery equipment. A letter, wire or phone call to our nearest office places the information in your hands without obligation. Get *all* the facts—and you'll get Multiclone!

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ENGINEERS, DESIGNERS & MANUFACTURERS OF EQUIPMENT FOR COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS

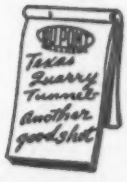
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PRECIPITATION CO. OF CANADA, LTD., DOMINION SQ. BLDG., MONTREAL



Du Pont Technical Service Representative's plan of "Nitramon" tunnel shot in Texas quarry.

TEXAS QUARRY TUNNEL SHOT ... another "Nitramon" success

... reports Du Pont Technical Service Representative



As the Du Pont Technical Service Man's field sketch shows, the adit of the quarry tunnel measured 44' with two laterals of 77' each. It was figured the shot would yield 53,230 tons and that 15,532 lbs. of "Nitramon" would be needed . . . a ratio of 3.43 T/#.

Note placement of six charges, the elevations and position of crest before and after the shot.

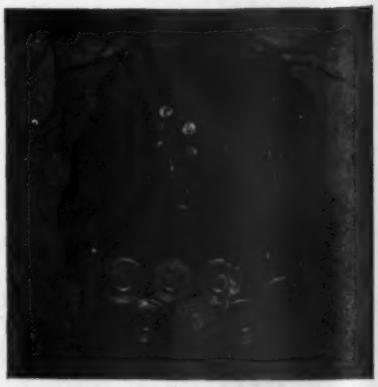
If your quarry presents a blasting problem . . . call upon Du Pont Technical Service Representatives. They will gladly assist in planning your shots . . . give you the benefit of their experience.

"Nitramon," the safest blasting agent, is easy to use. Though it cannot be detonated by the strongest caps, open flame, friction or impact of rifle bullets—a combination of "Primacord" and "Nitramon" Primer readily detonates it. Obtain complete information from any Du Pont Technical Service Representative.

E. I. du Pont de Nemours & Co. (Inc.)
Explosives Department
Wilmington 98, Delaware



Delivering "Nitramon" into the tunnel. Note metal wheelbarrow in use.



Partially completed units in foreground. Note completed unit.

DU PONT "NITRAMON"

DU PONT
REG. U. S. PAT. OFF.

A Product of Du Pont Explosives Research

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

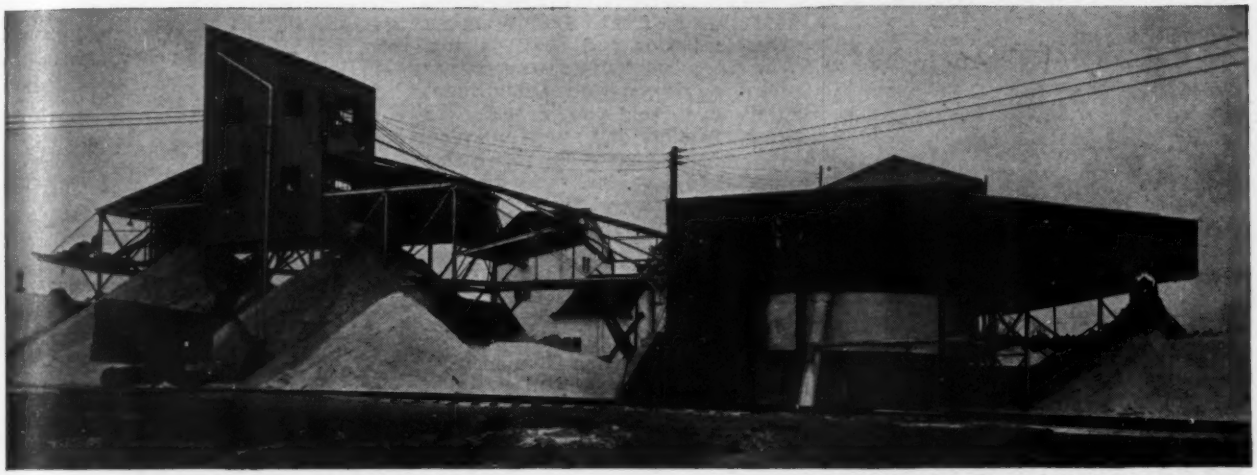
You fill in the blanks . . .

Dorr equipment delivers

MESH_____

TONNAGE_____

END USE_____



What are you after . . .

- white, low-iron glass sand?
- concrete sand of fixed fineness modulus?
- quality foundry sand?
- wash-water recovery?

If the sands you want are *in* your deposit, Dorr equipment will get them *out*, combine them to specification . . . economically.

Take it from Dorr equipment users: Dorr knows how to *devise methods* and *build machines* that deliver sand of accurate mesh and ratio in any volume. Dorr knows how to squeeze the biggest proportion of the most profitable sands from a given deposit.

Let a Dorr engineer talk over your sand production problems with you. Write for your copy of "Making Prescription Sand at 50 Tons an Hour".

Dorr Sells
SOLUTIONS TO PROBLEMS:

TO WASH and remove clay and fines . . .
Dorr Classifiers

TO FRACTIONATE and **RECOMBINE** for cut-to-measure sands . . . Dorr Hydroseparators
Dorrco Sizers
Dorr Classifiers

TO CUT AT GIVEN MESH . . .
Dorr Hydroseparators
Dorr Classifiers

TO RECLAIM WASH WATER . . .
Dorr Thickeners

. . . and only Dorr, of course, sells Dorr EXPERIENCE

DORRCO 1515

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against
ROCK DUSTS



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RESPIRATOR

Equipped with the new cushion facepiece, the Comfo combines approved, positive protection against rock dusts with snug-fitting comfort, smart appearance and low breathing resistance. Easy to maintain. Twin filters are quickly replaceable on the job.

* U.S. Bureau of Mines-Approved



M·S·A
Dustfoe
RESPIRATOR

The Dustfoe is a single filter respirator with transparent plastic facepiece and filter case that permits quick inspection for proper seal and cleanliness. This approved respirator is lightweight, comfortable and compact. Easy to work with!

* U.S. Bureau of Mines-Approved

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MINE SAFETY APPLIANCES CO.
Braddock, Thomas and Meade Streets
Pittsburgh 8, Pa.
District Representatives in Principal Cities

Dust Control

(Continued from page 126)

include details of design of control equipment, analysis of costs and recommendations for continued maintenance of control.

Price Controls

The third paper formally presented was "Price Control Problems and Policies of O. P. A. in the Transition Period," by W. L. Pringle of O. P. A. Mr. Pringle's presentation covered the related subjects of pricing and inflation broadly and some of his opinions as to likely developments on the economic front. Despite many favorable trends and developments, such as alleviation of manpower shortages, peacetime employment peaks, etc., he said there nevertheless is serious danger of a severe inflation within a year or more. He anticipates a balanced federal budget in the next 12 months or so and probably a sizable surplus of revenue from taxes over government spending but the danger lies in (1) the time required to get increased supplies of consumers goods available for sale, (2) demand will exceed available supply for many commodities for from months to years, (3) businesses will scramble for materials to rebuild inventories in the absence of price and inventory controls and (4) the enormous liquid assets owned by individuals and businesses. The fear of inflation and speculative fever spreading through the country has created a psychological situation, he said, that would have serious effects upon actual creation of inflation.

Mr. Pringle believes that pent-up demands for many commodities will probably have been satisfied during the year and, he predicted, the cost and earnings position of most industries should improve during the next 12 months due to larger volume, increased labor efficiency, technological improvements, etc. Wage increases may upset this predicted improvement. If these favorable developments occur and confidence in general price stability is established, he believes the danger of severe inflation and collapse will be past by the middle of 1947.

O. P. A. policy on decontrol of prices consists of two parts, he said. Ceilings on commodities important in the cost of living or business costs will be suspended when supply and demand relationship indicate that prices will not rise, to be removed completely if that judgment proves correct. Ceilings on commodities that are not important will be removed gradually.

In the ensuing discussion, Mr. Pringle said that railroad ballast, also refractories has been recommended for decontrol. Dolomite, both raw and burned, and flux stone will likely follow and industrial sand will be considered next. O. P. A. is getting a flood of requests for wage-price adjustments, he said, and it is desired to get rid of much administrative load by concentration on necessities like rent. O. P. A. is willing to grant price increases according to labor increases and other actual cost increases, he said, the sequence being to adjust for cost increases other than labor first. Executive secretary, V. P. Ahearn commented that, due to the highly competitive nature of the industrial sand industry, the industry would be unable actually to secure prices equal to the cost increases.

Industry Problems

Executive secretary V. P. Ahearn initiated and led an informal discussion on wage-price policy, car supply, price controls, priorities for equipment and supplies and collective bargaining. He viewed the outlook for equipment pessimistically because C. P. A. preference ratings are being granted principally for so-called "critical" industries, although he would not want to see industrial sand on the critical list. Due to subsidies, he looks for creation of an overcapacity in some of the critical industries. Availability of equipment will be tough for a year or possibly two or three, in his opinion, although there likely would be better chance to purchase dust collecting equipment where compliance with law is a factor. In the latter event, O. P. A. form 541A should be filed.

Car supply and condition of cars are becoming increasingly serious; in fact mounting costs due to bad car conditions are more serious than increases in labor rates. The prediction is that, due to the coal situation and heavy movements of crops and foodstuffs to come, the car supply situation will become much worse, with the prospect that open top cars will be unavailable. The Association will call to the attention of the Association of American Railroads, by letter, the seriousness of the car situation.

One producer mentioned that the railroad involved in his case pays him 50 cents for each car that is cleaned, although there is no legal responsibility on the roads for such service. However, he has found his clean up costs to be much higher.

Mr. Ahearn predicted that a tremendous water shipping strike will come very soon and that legislation of some sort is forthcoming which, in the end, will serve no good for industry. There was considerable discussion of the request by the railroads for an increase of 35 percent in freight rates for industrial sand, which finally resulted in the Association taking a stand that it will protest the increase in rates.

The balance of the meeting consisted of presentation of committee reports and resolutions and brief comments from consulting engineer Stanton Walker. Mr. Walker confined his remarks to the technical informa-

(Continued on page 140)

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FOR MAXIMUM WEAR RESISTANCE on any part receiving impact and abrasion always hard-face with STOODY SELF-HARDENING... Doubles the life of manganese steel equipment!

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STOODY HARD-FACING ALLOYS
Retard Wear Save Repair

(Continued from page 138)

tion letters now being sent out from his office as a new service to the membership.

A. WARSAW, chairman of the Committee on Control of Dust in Abrasive Blasting, reported results of a meeting with the Industrial Hygiene Foundation in April and on the field work being conducted by the Foundation which will culminate in preparation of a manual of recommended practices if the Foundation recommends its compilation. The field work involves contacts with manufacturers of dust control equipment as well as users.

C. MATHIESEN, chairman of the Committee on Foundry Sand, reported that the committee, inactive during the war, will have no comprehensive research program but will remain active to consider problems as they arise.

Registration

Ahearn, Vincent P., National Industrial Sand Assoc., Washington, D. C.
*Bergs, James B., Pioneer Silica Products Co., St. Louis, Mo.
*Cable, J. S., Minnesota Mining & Mfg. Co., Akron, Ohio.
Campbell, E. J., Sun Sand Co., Thayer, W. Va.
*Campbell, Harte, Sun Sand Co., Thayer, W. Va.
Cleary, Jack, Sand Products Corp., Cleveland, Ohio.
*Coxey, J. S., Jr., Industrial Silica Corp., Youngstown, Ohio.
*Cronenweth, Russell, Great Lakes Foundry Sand Co., Detroit, Mich.
Durstine, E. M., Keener Sand & Clay Co., Columbus, Ohio.
*Farmer, A. N., Sand Products Corp., Cleveland, Ohio.
*Farmer, Sterling., Sand Products Corp., Cleveland, Ohio.
*Finkbiner, E. W., South Jersey Sand Co., Dividing Creek, N. J.
*Gregory, A. Y., Whitehead Bros. Co., New York, N. Y.
*Hardy, C. M., Houghland & Hardy, Evansvile, Ind.
Hardy, H. P., Houghland & Hardy, Evansvile, Ind.
*Hardy, T. W., Hardy Sand Co., Evansvile, Ind.
Hatch, Theodore F., Ind. Hyg. Foundation, Pittsburgh, Pa.
*Hay, R. G., Ayers Mineral Co., Zanesville, Ohio.
*Manley, D. E., Manley Sand Co., Rockton, Ill.
*Manley, Lyle, Manley Sand Co., Rockton, Ill.
Mathiesen, C., Whitehead Bros. Co., Albany, N. Y.
*Matthews, T. C., Penna Glass Sand Corp., Lewistown, Pa.
*Miller, Alfred J., Whitehead Bros. Co., New York City.
Miller, John H., Mifflin Sand Co., Lewistown, Pa.
Muhlitner, Wm. J., Great Lakes Foundry Sand Co., Detroit, Mich.
*Nordberg, B., Rock Products, Chicago, Ill.
*P. W. Palmer, Browntown Silica Co., Browntown, Wis.
*Pringle, Wm. L., Office of Price Administration, Washington, D. C.
*Putnam, John F., The National Silica Co., Oregon, Ill.
Sawyer, Ed. C., Ayers Mineral Co. Zanesville, Ohio.
*Schlesinger, Arthur B., New Jersey Pulverizing Co., New York City.
*Strauss, Junius M., Deckers Creek Sand Co., Morgantown, W. Va.
*Tanzer, Arnold H., New Jersey Pulverizing Co., New York City.
Thornton, George A., Ottawa Silica Co., Ottawa, Ill.
*Thornton, Henry C., Ottawa Silica Co., Ottawa, Ill.
Trauffer, W. E., Pit and Quarry, Chicago, Ill.
Walker, Stanton, National Industrial Sand Assoc., Washington, D. C.
Warsaw, A., Wedron Silica Co., Chicago, Ill.
Waters, Theodore C., National Industrial Sand Assoc., Baltimore, Md.
*Wolf, C. R., New Jersey Silica Sand Co., National Pulverizing Co., Millville, N. J.

*Mr. and Mrs.

Batching Plants

(Continued from page 85)

ing plants. A Robinson air-activated cement pump located at each unloading pump will pump cement at the rate of 250 bbl. per hr. into the main bins, which have two compartments each, and a similar pump, but of traveling type, handles cement from the main bins to the working bins in the batching plants. Thus, one type of cement may be handled into a bin while a second type is being transferred to the batch plants.

Two 150-hp. forced draft boilers at each location provide the steam for winter bin operation and two 400 c.f.m. air compressors serve the cement pumps. There is a 50-ton platform scale and office at each plant and one-way driveways throughout.

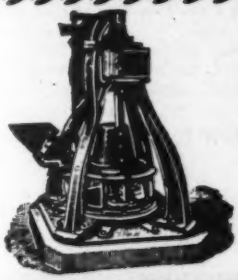
This installation of distribution facilities represents an important step in the company's post-war program for efficiency of operation, which comprised complete rebuilding of the production plant at Port Washington and modernization of the Northport plant in 1941 and 1942. Both production and distribution now have great flexibility and employ such devices as telephone equipment to expedite handling to and from the various plants. It was pointed out in an article (February, 1943, ROCK PRODUCTS) that the Port Washington plant was one that was far ahead of the times in design and one that was built in anticipation of post-war demands and competition, that is intense in a highly fluctuating New York market. Completion of adequate distribution facilities that permit efficient transportation has made the company's operations, overall, outstanding. A new towboat with 650-hp. Busch-Sulzer Diesel engine has just gone into service in addition to three already in operation to facilitate further the delivery of aggregates.

The new plants were designed and built under the direction of H. F. Garvin Pelsue, president, Metropolitan Sand and Gravel Corp. Other officers of the company are L. L. Phelps, vice-president and secretary; J. P. Leonard, treasurer; E. D. Boylston, assistant secretary. Howard Marsh is general superintendent of operations.

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for over 50 years

Leaders in the Manufacture of Cement Pulverizing Machinery used the World over for the Production of Cement Materials.



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proves beyond doubt the great efficiency of

"THE GRIFFIN MILL"

CHICAGO, ILL., Dec. 9, 1896.
"The Griffin Mills are giving most excellent results, and are all that you claim for them."
CHICAGO PORTLAND CEMENT CO., by NORMAN D. FRASER, *Pres.*

WHITTAKER, N. Y., Dec. 19, 1896.
"We now have in use 19 Griffin Mills, which give us good satisfaction. I do not think there is a Mill in the market to beat them." ALPHA PORTLAND CEMENT CO., CHAS. A. MATCHAM, *Supt.*

EGYPT, PENNSYLVANIA.
"We have been using the Griffin Mills manufactured by you since 1890. We have now 21 in all in our plants. In matter of quantity of material produced per hour, fineness of Cement ground, and economy, we find them far superior to Millstones or any other form of Mill."
AMERICAN CEMENT CO., JOHN W. ECKERT, *Supt.*

NR. GRAY'S, ESSEX, ENGLAND, Feb. 28, 1896.
"We consider the Griffin Mill to be a great improvement on any Mill we have tried. We run our Mills constantly day and night for weeks, without a single stoppage."
P. P. GIBBS & CO., Ltd., by D. H. GIBBS.

HEIDELBERG, GERMANY, April 1, 1897.
"We are thoroughly satisfied with the performance of the 60 Griffin Mills furnished us by you."
PORTLAND CEMENT WORK HEIDELBERG,
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Send for free illustrated catalogue containing full description of the Griffin Mill and convincing testimony from others of the largest Cement Makers of the world.

BRADLEY PULVERIZER CO., 92 State St., Boston.

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ALPHA PORTLAND CEMENT CO. HAVE USED BRADLEY MILLS OVER 50 YEARS AND ARE USING BRADLEY MILLS IN MOST OF THEIR PLANTS.

AMERICAN CEMENT CO., NOW GIANT PORTLAND CEMENT CO., HAVE BEEN CONTINUOUS USERS OF BRADLEY MILLS FOR OVER 50 YEARS.

These are just a few companies that have used Bradley Mills for many years.

THE NAME "BRADLEY" MEANS THE BEST IN PULVERIZERS ALL OVER THE WORLD

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BRADLEY MILLS ARE ALSO LEADERS IN GRINDING AGRICULTURAL LIMESTONE, PHOSPHATE ROCKS, REFRACTORY CLAYS, ETC.

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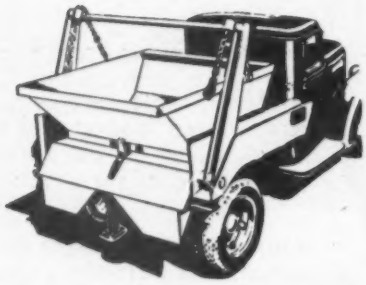
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***Brooks* LOAD LUGGER**

is a cost-cutter because it saves manpower and time and conserves equipment wherever hand-loading is involved on general construction jobs, quarry work, loading riprap, building roads, or stripping overburden. The LOAD LUGGER operates with 5 to 10 detachable buckets. It is easily installed on any standard truck chassis. One-man controlled. Requires only 15 seconds for loading or dumping.



Load Lugger used for feeding crusher in Quarry.

Write for Catalog No. 46.

BROOKS EQUIPMENT AND MFG. CO.

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Distributors in All Principal Cities

Fluxstone

(Continued from page 122)

of stone and sand per year. Each quarry is equipped with a commercial stone washing plant, and we carry large stocks of stone for commercial trade."

Mr. Jacobs commented on the great strides in mechanization of quarries from the horse-drawn cars to present methods of haulage by large trucks and conveyors. "Another change from the old days," he pointed out, "is that three of our quarries have chemical laboratories by means of which we are able to analyze our stone quickly. Thus, we can supply stone of a constant analysis to the blast furnace and open hearth departments. Such improvements have a great deal to do in the making of better iron and steel."

Concrete Products Developments

Supplementing our summary of developments within the concrete products industry since the 1890's, the editors asked a few outstanding concrete products manufacturers to contribute comment on accomplishments of their own companies, for publication.

BENJAMIN WILK, Standard Building Products Co., Detroit, Mich., one of the industry's leading thinkers particularly in research and technology, wrote:

"As I look back over 30 years contact with the concrete block industry, I am amazed by the progress from a backyard industry to a major element in the great building industry. Plants with capacities of 1000 block a day were considered good sized plants. Today there are a number of plants producing 20,000 block a day. That means large capital investments.

"From a production standpoint we were pioneers in using high early strength cements for making concrete block. We found after careful tests that a dollar of high early strength cement was more efficient for us than a dollar of normal cement. This is particularly important for the manufacturer who is trying to produce a high quality product at an early age.

"We have also tried to improve methods of curing, and have used natural gas as heat for a number of years. Control of production to develop lower costs and still to produce a high quality product is very important. We believe wholeheartedly in concrete block and have proved our faith by building our own eight room home of concrete block with concrete first floor nine years ago. The future of concrete block masonry is assured."

HERBERT F. GEIST, president, The Geist Coal and Supply Co., Cleveland, Ohio, wrote the editors as follows:

"As one of the second generation in our company, I can look back and see

RYERSON STEEL IN STOCK

Call Ryerson when you need steel—any kind, shape, or size. Large stocks are available at eleven convenient plants. Ask for a Ryerson Stock List—your guide to quick shipment of steel.

Principal Products Include:

Bars • Plates • Sheets • Structurals
Inland 4-Way Floor Plate • Mechanical Tubing
Boiler Tubes • Hi-Bond Reinforcing Bars
Allegheny Stainless • Alloy Steels • Tool Steel • Babbitt Metal • Wire • Chain
Bolts • Rivets, Etc.

JOSEPH T. RYERSON & SON, Inc.

Steel-Service Plants at:

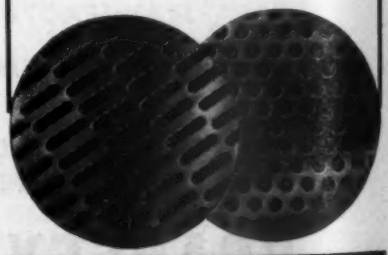
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the tremendous strides made in our industry. This progress has been mainly in the relatively recent years. Production methods of other industries are finding their way into our plants. Elimination of backbreaking work, round the clock production, good wages, high standards of quality, close tolerances of dimension, labeling of product—all these indicate that we are at last taking a rightful place in perhaps the most interesting of all industries, i.e. the building industry.

"Production is now being developed to a large volume. We accept orders casually and sometimes, I'm afraid, arrogantly. The time will come and perhaps sooner than we suspect, when we must sell our wares in the market place for their real worth. In the field of sales promotion practically nothing has been done. The door is wide open and people are begging to be told the possibilities of the many applications of blocks to fill their needs. Sometimes I believe our customers have more imagination than the manufacturers. We are apt to thump our chests about today's production and utterly fail to think of the job we must do in telling our customers of the manifold uses.

"We must tell the architect, the engineer, the builder, the home owner and tenant. We must never let the farmer forget the unlimited uses. Factories, food storage buildings, garages, houses, garden walls, terraces, and thousands of other uses, if properly developed, will offer opportunities for what I believe will be a continually expanding business.

Rather than reminisce about the good old days of callouses on the hands, blisters on the feet and an aching back, I'd rather sit as I now am in my leather chair, feet on the desk and vision the days to come when we will be offering a far better product to an ever increasing market."

Machinery Improvements

An associate of Louis Gelbman, Concrete Units, Inc., New York, N. Y., a prominent figure in the development of vibrating-type concrete block machinery, submitted the following:

"Among the many names of men who have contributed to the success of the concrete masonry industry we find well up at the head of the list the name of Louis Gelbman. Mr. Gelbman's association with concrete dates back to 1912 at which time he worked as a cement finisher. During World War I he was with the U. S. Navy as an inspector on concrete barges.

"At the termination of his services with the Navy he went into the concrete block business, making his first block by pouring concrete into moulds. There followed a series of new plants each larger and better equipped than the preceding one, culminating in the modern plant now in operation in New York City."

(Continued on page 144)

workability

durability

and controlled air

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Merrick Scale Mfg. Co.
Passaic, New Jersey

(Continued from page 143)

Mr. Gelbman saw the need for a different, more economical and more efficient type of block machine about 1926. His research culminated in the development of vibratory block machinery which has been an important contributing factor to the position of prominence that the concrete masonry industry holds today, according to our correspondent who said, further:

"Mr. Gelbman was not satisfied with this one contribution. He has since developed several important items all in connection with the concrete masonry industry. His latest is the development of a new lightweight concrete aggregate and automatic machinery for its manufacture; also an entirely automatic block or brick plant which gives promise of once more revolutionizing the industry."

JOHN L. STRANDBERG, Concrete Building Units Co., Kansas City, Mo., contrasts operations of 20 years ago with modern practice in the following:

"The progress which has taken place through the past 20 years in concrete products manufacturing has been so great that all expectations have been exceeded. The heights that this industry can attain in the future can be seen only through imagination.

"In 1924, when the Kansas City Duntile Co. came into existence (now known as the Concrete Building Units Co. of Kansas City) the machinery used in the production of concrete blocks, was operated entirely by hand. Knowledge of the necessity for curing concrete was not universal, 'designing a concrete mix' was an unknown term, consequently, the concrete block of 1924 was as crude as the machinery on which it was made.

"Architects, contractors and masons at that time were not acquainted with the product. There was no market for concrete block; however, manufacturers throughout the country with their diligent and untiring efforts started the 'ball rolling.' The public gradually became informed and conscious of concrete block, and the industry started the uphill climb.

"With the coming of the 1930's came better machines, more knowledge of concrete, and a public more interested in concrete products. Use of larger mixers, semi-automatic machines and crude curing rooms had an amazing effect on the strength and uniformity of the units. Today, because of the astounding amount of time and money that has been spent on research and the inventions of modern, automatic machinery, the industry has grown so large that even when the manufacturer sits back and surveys the progress he is amazed.

"The production of a concrete products plant of today, exceeds by hundreds of times the quantity of units manufactured 20 years ago. Because of the knowledge of water-

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cement ratios, design of concrete mixes, and the all-important process of proper curing, the strength of concrete has increased many times over. Because the public has been educated and taught the value of solid concrete construction, demands for the product have attained amazing heights.

"To set a goal for the future of the concrete world is almost impossible. One of the most helpful aids in the progress of the concrete products manufacturer has been ROCK PRODUCTS. It has been a source of information and a means by which all manufacturers in the nation have been able to keep 'up to date' through the years."

P.C.A.'s Contribution

In reply to our request for comments on contributing factors to the development of the concrete masonry industry, John R. Ruhling* commented and interjected precautions as follows:

"Practically all of the important developments which have made concrete the most widely used of construction materials have come in the half century since the founding of ROCK PRODUCTS. Although portland cement was first manufactured in America 25 years before ROCK PRODUCTS was founded, the magazine had passed its first birthday before the volume of American-made portland cement exceeded the tonnage of imported cement used in the United States.

"Although the orderly, planned scientific research program which has made the Portland Cement Association notable did not start until 1916, considerable work was done in private testing laboratories and in the laboratories of cement companies after the founding of the parent organization of the Association in 1902. This early research consisted, for the most part, of studies to answer questions raised by users of portland cement and to solve specific problems encountered in concrete construction — problems which if left unsolved might have seriously limited the uses of concrete. The Association still follows the basic policy of concentrating on research likely to be most helpful to users of concrete.

"An outstanding example of the industry-wide benefits of scientific research and engineering field work conducted by the Association is the vast increase in the use of concrete masonry in the last two decades. Years of intensive research and testing have shown concrete masonry manufacturers how to make a product of high strength, durability and fire-resistant characteristics. During the war and since, concrete masonry

(Continued on page 147)

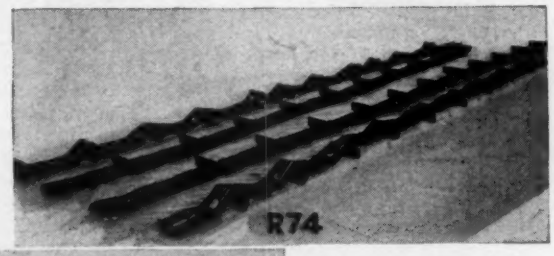
*Manager, Housing and Cement Products Bureau, Portland Cement Association.

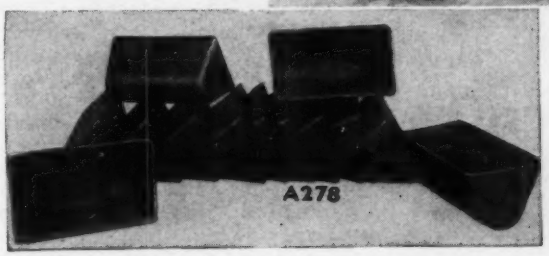
"The Toughest Steel Known" Spells Economy in the Toughest Conveyor Service

The handling of sand, gravel and crushed rock imposes drastic shock loads and heavy abrasive wear on the chain, sprockets and buckets employed.

The toughness and abrasion resistance of austenitic manganese steel are qualities without which such equipment will be unnecessarily costly to maintain.

The two most important requisites in elevator and conveyor chain — durability and freedom from breakdown — manganese steel have an assured service life greater than those of ordinary metal. They add length of life to transmission chains through taking on a smooth polish in operation. In a typical application where gray iron sprockets had to be replaced every few months, Amsco sprockets showed





R-74. 70' of No. 111 manganese steel conveyor chain with F-2 attachments for sand and gravel plant application.

A-278. A group of Amsco manganese steel elevator buckets punched for chain attachment.

find their highest development in Amsco Manganese Steel Chain. Having a test-bar tensile strength of 100,000 — 130,000 lbs. p.s.i. and a developed-in-service hardness up to 550 Brinell, combined with a tough shock-resisting body-metal, manganese steel chain withstands for long periods abuse that quickly destroys ordinary chain.

Examples of three, five and even ten-to-one service life for Amsco chain are on record.

Sprockets, and idlers, too, of very little wear after three years in service.

Elevator buckets, also, are subjected to severe abrasive action and shock stresses. Amsco Manganese Steel Buckets have effected substantial economies in abusive applications. These buckets can be supplied in standard sizes, plain or punched.

Ask for descriptive Bulletins 742-CN and 842-WS.

Joliette Steel Limited, Joliette, Quebec, owned by American Brake Shoe Company, produces and sells Amsco Manganese Steel Castings in Canada.



R-285. A 9-toothed manganese steel sprocket wheel for an H-122 drag chain conveyor.

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THE GILSON SCREEN COMPANY

P. O. Box 186, Mercer, Pa.

Sand and Gravel Industry

(Continued from page 107)

ing with a predetermined amount of the coarser than No. 16 sand, he calculated the proper amount of natural sand to add to fill all the voids in the coarser material; thus 10 lbs. of natural sand was added to 16 lbs. of the coarser fractions to produce a mixture containing only 25 percent voids. Exactly similar methods would be employed in actual production today. His contribution to the science of sand preparation may have impressed engineers and researchers, but it did not take hold in the industry for at least a quarter centry.

Hydraulic separation to prepare a sand along the lines suggested by Prof. Reinhart in 1907 might have been practicable in the sand and gravel industry at that time, because the mining industry had already developed it; but, as a matter of record, it was not until the early 1920's when Edmund Shaw, a mining engineer with a great deal of experience in hydraulic classification, joined the editorial staff of ROCK PRODUCTS, that the processing of concrete sands by hydraulic separation came to be fully understood by commercial sand and gravel producers. We consider his contributions to the literature on what he called the production of "prescription sands" one of the outstanding services our journal has rendered this industry.

Coincident with these articles and many others on operation, published during the 1920's, our journal kept up a consistent editorial campaign to make sand and gravel producers better informed on specification requirements and the reasons for them, as well as suggestions on how they could be met. Along the same lines and for a similar reason the editor of ROCK PRODUCTS took a prominent part in the resuscitation of the National Sand and Gravel Association in 1917. Ours, and the association's, reward came in 1926, when Stanton Walker, already known for his research work in concrete, was appointed to head the engineering and research work.

Ready-Mixed Concrete

Before closing this brief discussion of the development of the sand and gravel industry, some reference should be made to ready-mixed concrete, which, in its recent rapid growth, is largely an off-shoot of the sand and gravel industry. Ready-mixed concrete, hauled in dump trucks was in common use for construction of the subways and water-supply tunnels in New York City several years before its commercial possibilities were recognized. Probably the first commercial producer was Alexander Foster, Jr., in Philadelphia, Penn., in the early 1920's—using ordinary dump trucks to deliver wet-mixed concrete from a central mixing plant. The Charles Warner Co. bought out Mr. Foster and his partner and in 1928 we find the Warner company building a second mixing plant, but still using dump trucks for delivery. However, the year before, in April, 1927, the Barrymore truck mixer had been developed on the West Coast. As originally used it was not a transit mixer; it was designed to haul a dry batch to the job, where water was added with mixing done at job site.

By 1929, agitator-type truck bodies had been developed and were being used in place of dump trucks for making deliveries of central plant mixed concrete. Stephan Stepanian, Columbus, Ohio, is probably the inventor of the agitator and transit-mix type of truck body, although his early applications for patents were turned down, due primarily to a misapprehension on the part of the Patent Office examiners as to the genuine novelty of the device. Since concrete mixers on wheels had been used before that, they professed to see nothing new in a truck mixer. Of course, the possibilities of transit mixing became apparent with the agitator type truck body, and the controversy began over the relative merits of central-plant mix and transit mix, of which we still hear occasional arguments.

Hydrated Lime

(Continued from page 108)

of the theory of thermodynamics to the lime industry was the Eldred process, whereby hot waste gases from the top of the kiln were recirculated and used to dilute the combustion gases, and hence provide lower temperatures as well as heat conservation. This was important because after cord wood became too expensive a fuel for lime kilns, coal-fired furnaces did not provide the right flame or kiln temperatures to make top quality lime.

The first rotary kiln to be used for burning lime, so far as we can determine from the record, was installed at the California Portland Cement Co.'s lime plant in 1893. Oil was, and still is, used for fuel, a steam or water-vapor spray provided means for tempering the flame. Another early rotary kiln installation was at Natural Bridge, N. Y. About the same time the Union Carbide Co. began to use rotaries at its Niagara Falls, N. Y., plant. There has been a long battle between vertical shaft kilns vs. rotary kilns for lime burning, and we have by no means heard the last of it. The shaft kiln took a new lease of life when Victor J. Azbe, consulting engineer, began to study and improve its thermal efficiency, and the quality and uniformity of the lime made in shaft kilns. His first article appeared in ROCK PRODUCTS, Aug. 11, 1923, and he has written exclusively for our journal since then. Mr. Azbe has also contributed much to efficient rotary kiln operation.

Concrete Products

(Continued from page 145)

has been widely used for important industrial and commercial construction and to build thousands of attractive, firesafe, low maintenance cost dwellings.

"Only through widespread distribution of quality concrete masonry can the industry reach its full measure of success and render to the building industry the low annual cost construction which concrete masonry has to offer. In my opinion no one factor is more important for the production of a quality unit, than adequate moist curing and drying. Extensive plant improvement will be required to give the industry adequate moist curing and drying facilities to accommodate full capacity.

"The industry cannot hope to hold the gains it has made during the past 20 years merely by increasing its production. To the extent that quality is sacrificed by either old or new plants and regardless of the reasons, the future of the industry is jeopardized. The bright future predicted for concrete masonry will be bright only if the rank and file of manufacturers make quality products and direct their major efforts toward market building."

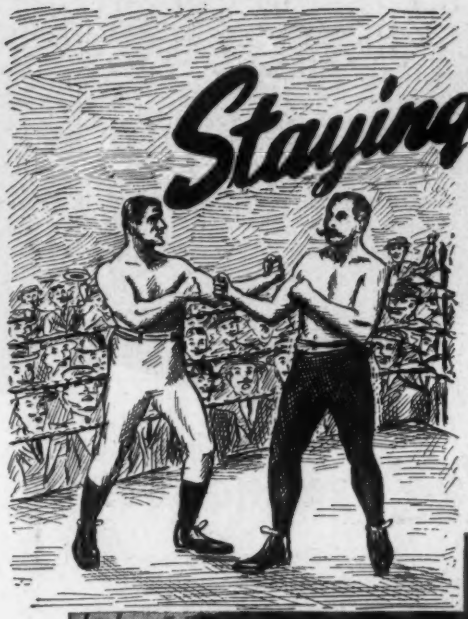
DEANE R. LYNDE, Cinder Concrete Products, Inc., Denver, Colo., president of the National Concrete Masonry Association, said:

"Over the past quarter century our company has participated in and seen the concrete masonry unit industry grow from hand operation to almost automatic operation today. We have fought for and watched the acceptance and use of the product from practically nothing to what is now universal acceptance. The war program helped us, but was not wholly responsible because we had to all intents and purposes reached that goal before the war started. New and proven inventions are in the offing and will be promptly accepted by progressive manufacturers, and they will enable us to make a better product and sell it more economically.

"It was slow and tough going for what seemed like a long time, yet with today's attainments before us, we have a certain amount of pride in having had a part in the industry's growth. We feel that we have made one important contribution to the industry as being the first or among the first to adopt and use high temperature curing, proving the feasibility of that method. At the outset we were strongly advised against it by the leading authorities in the field, yet today those same authorities strongly recommend its use.

"ROCK PRODUCTS is to be congratulated on its 50th Anniversary Edition. Their struggles have doubtless differed little from those in the industry. They have done much to aid and

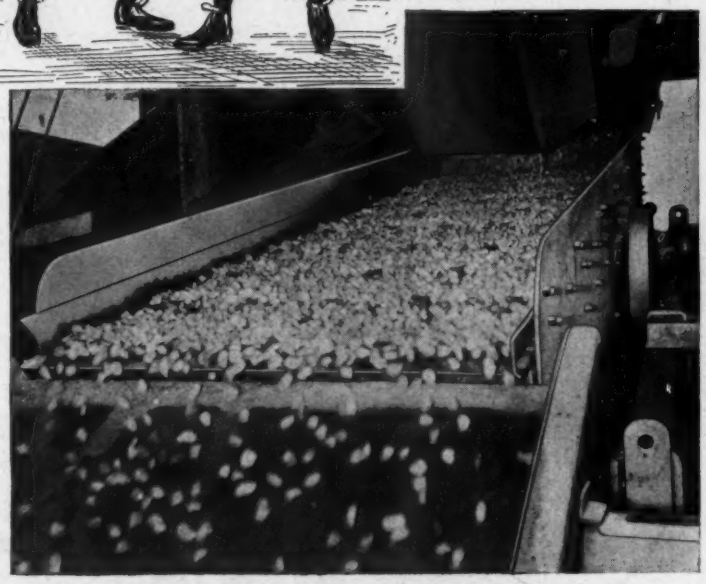
(Continued on page 148)



Staying Power!

SULLIVAN-KILRAIN 75 ROUND FIGHT

In the glaring sun of a hot July 8th day in 1889 at Richberg, Mississippi, the great John L. Sullivan and Jake Kilrain fought it out. Sullivan won on points. Here was one of the greatest tests of staying power in the history of sports.



THIS SECO VIBRATING SCREEN NOW IN EIGHTH YEAR OF TROUBLE-FREE OPERATION

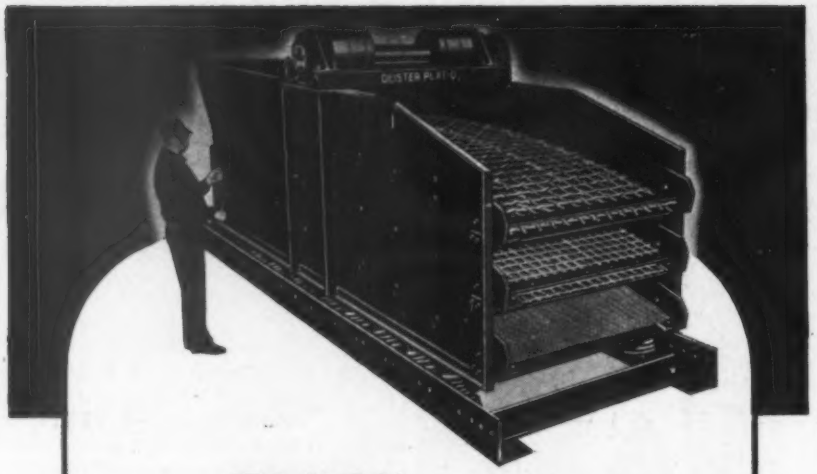
Here's another example of staying power! The Seco vibrating screen pictured here has been in service in the crushed stone plant of B. V. Hedrick, Lilesville, North Carolina, for over seven years, and has never been shut down for repairs. In this operation of secondary screening, about 225 tons per hour go onto the screen and its owners are enthusiastic about its ability to screen accurately at maximum capacity—year after year. Although this screen is rigidly mounted well up in the air, the absence of transmitted vibration (all the vibration is in the live body—the result of Seco's patented equalizer assembly) permits its operation without shaking or putting undue stress on the structure. Join with hundreds of leading operators everywhere who are enjoying extra production benefits with Seco Vibrating Screens.

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Concrete Products

(Continued from page 147)

assist the advancement of concrete products and have every right to feel proud of the publication they are giving us today. Their future as well as that of the concrete products industry is assured. Our aggregation of rugged individualists will see to that, yet we should all watch closely new and untried ventures which are daily springing up in our industry and do our best to see that they do not set us back to a point which will be difficult to overcome."

PHILIP PAOLELLA, vice-president of Plasticrete Corp., Hamden, Conn., one of the nation's most aggressive producers and merchandisers of concrete masonry, contributed the following:

"Plasticrete Corp. was started in 1922 as the Hamden Building Tile Co. by my father, Ciro Paolella, in a small garage in Hamden, Conn. We had a hand-operated, face-down block machine that made 175 8- x 8-x 16-in. block per day, rock-faced or panel faced. By 1930 we had moved to our present location and were operating three power tampers producing about 3500 block per day. In 1935, we began production of cinder block, and in 1937 installed our first modern production equipment employing the principle of vibration. Our production reached 5500 8-in. block per day. At this writing we are operating two Vibrapacs and produce 28,000 8- x 8- x 16-in. PLASTICRETE BLOC on a double 10-hr. shift operation, and installation of the third machine is almost completed. When we are in full operation we expect to turn out 40,000 PLASTICRETE BLOC per day. This block is a two-core unit of special design for which patents have been applied.

"Our large advertising budget speaks for our ideas along the lines of promotional tools for the industry. We use newspaper, billboard, trade paper, business paper and point of sale advertising, and have prepared our own catalogue on Plasticrete Products, together with several pieces of technical promotional material for the architect and engineer.

"We are looking forward to a busy future and our present plans include:

1. Continued modernization of our present plant.
2. Occupation of our new office and shop addition of 8000 sq. ft. which is just about completed.
3. Construction of a large capacity, modern cinder processing plant to serve our increasing requirements for a controlled aggregate.

"The cinder processing plant we are erecting will be quite an operation and will handle 1000 cu. yd. in an 8-hr. day.

"It goes without saying that ROCK PRODUCTS has helped us to keep posted on the developments of our industry in other parts of the country. We look forward to reading this magazine regularly and would not dare make the mistake of filing it away without having it read by at least three members of our firm."

Early Crushers

(Continued from page 104)

prevailed upon Mr. Smith, the owner of this quarry to introduce and sell the crusher in what was designated as the Chicago territory. Mr. Smith, through his experience, being thoroughly convinced of the merit of the crusher and the trustworthiness of its manufacturers, plus the added fact that he was an expert quarry operator, was of the opinion that this machine should find a place in every rock crushing plant in the country.

Practically all of the early gyratory crushers were used for reducing limestone. Later on they were installed for crushing granite, trap rock and iron ore, and the minimum sizes to which these crushers was set was about 2 in. With the general adoption of macadam roads a finer product was required and the stone was reduced to 1½ in. and at times to a smaller size.

The shaft of this gyratory crusher was the weakest part of the machine, and there were many failures. However, as the science of metallurgy advanced, shafts of better and sturdier materials were made, consequently these failures rapidly became fewer and fewer until at the present time it is a rare occurrence for a shaft to break, even though there are many thousands of gyratory crushers in operation.

Introduction of Manganese Steel

In 1895, manganese steel was used for the heads and concaves; however, because this metal had not previously been tried for the wearing parts of crushers, there was very little knowledge as to the results to be obtained with its use. Because of this lack of prior experience there were many headaches brought about through the troubles encountered due to the flow of the metal. In the beginning the heads were made as solid castings, zinced to the shaft, but with no provision for self-tightening of the head. Consequently, the heads loosened, resulting in wear on the shaft and, as a result, a great deal of metal was scrapped, because of improper design.

The manganese steel foundries, in those days, had difficulty in casting the larger heads, because they had no facilities for proper heat-treatment. As in so many instances, here again, necessity was the mother of invention and brought about the development of a renewable mantle placed over a cast-iron core, which was fitted to the shaft. This change did not overcome all of the difficulties because both the mantles and cores loosened. The self-tightening mantle was then developed by an American mining engineer in South Africa. It consisted of a gun-lock arrangement at the bottom of the mantle, which engaged the core. This eliminated the trouble with loose mantles be-

GUIDE TO DEPENDABLE PIPE FABRICATIONS

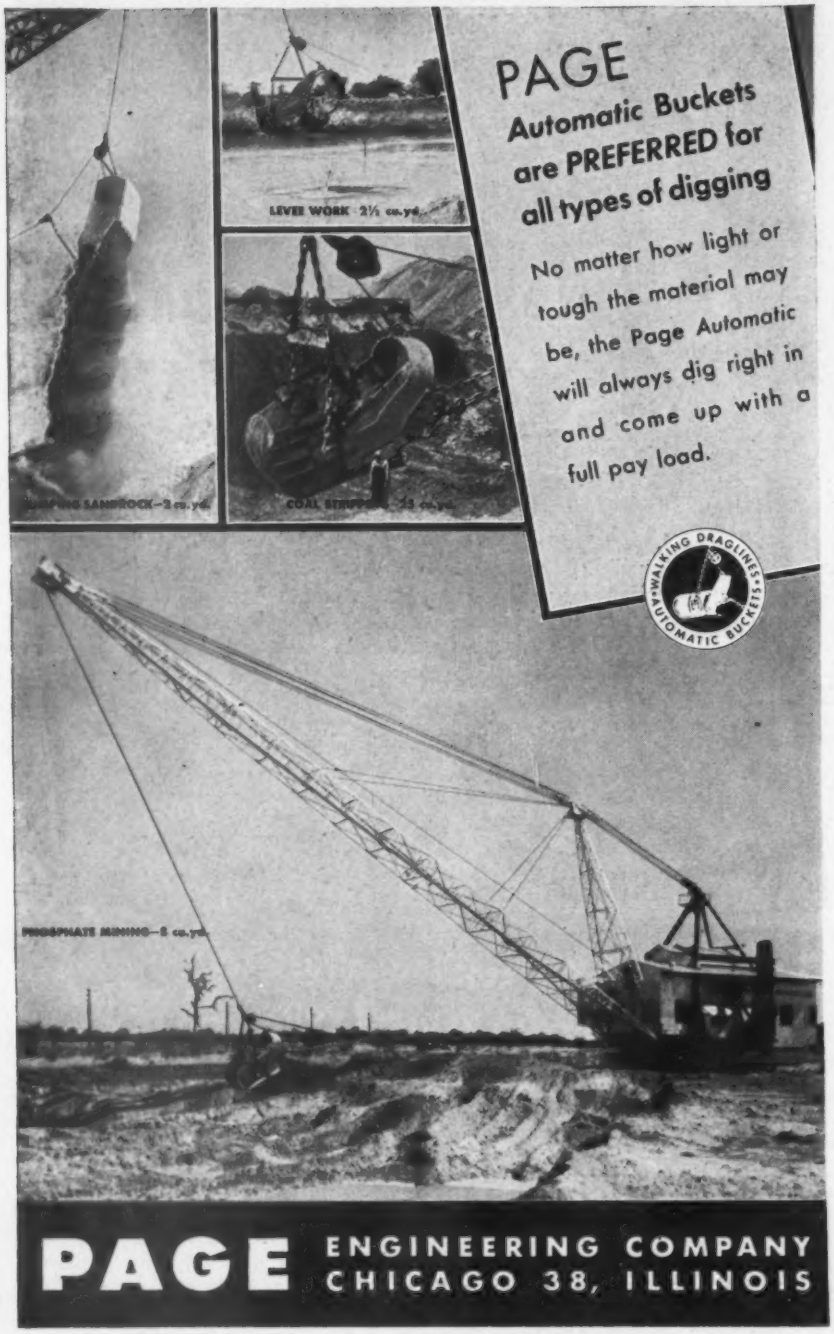


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THE NEFF & FRY CO.
CAMDEN, OHIO



NEFF & FRY STORAGE BINS

Early Crushers

(Continued from page 149)

cause the mantle being tight to the core pushed the core down.

About 1898, the Gates Iron Works, which succeeded the Eagle Iron Works attempted to improve gyratory crusher designs. In the early days the crushers made by the Eagle Iron Works were a hit and miss proposition because it was not designed as part of a complete line of machines. The sizes of the different parts were not proportioned in accordance with the sizes of the crushers, so that some of the smaller machines had parts much heavier proportionately than the larger size machines. Also, there was no uniformity in the design of the crushers. To overcome this difficulty, the writer investigated the basic principles of this machine and tried to discover a method of determining the capacity so that the different parts of the crushers could be developed and the proper size head and concaves supplied.

About this time, T. C. Ives, civil engineer, who designed and built the Third Avenue Elevated in New York, was given the task of formulating the factors which affected the capacity and size of product. This included various crushing angles, the motion of the head, the speed of the eccentric, size of the discharge opening and the size of the receiving opening. He plotted the various dimensions of the crushers and made calculations as to strength. At that time the largest gyratory crusher built had a receiving opening of 20 in. It was known as a No. 9 crusher and was considered to be an unbreakable brute.

To check the calculations of Mr. Ives, we made a thorough investigation of repairs of all gyratory crushers built previously and found that his figures were corrobrated. He had found that the smaller crushers were of much heavier proportions than the larger ones. The builders of crushers in those days did not seem to realize that the tabulations of Mr. Ives' figures and their own experience with repair parts on crushers, were correct. Consequently nothing was done to make the proportions of new crushers in accordance with the plotted charts. They continued to be made under the old practice, with a natural continuation of shaft breakage. As a matter of fact, it was shortly after Mr. Ives' figures were determined, that shafts broke in two of the large No. 9 crushers made under the old design; and it was necessary to ship both new shafts by express—one to Michigan and one to New York state—which in those days was very expensive.

Size of Crushers Grows

Up to 1906 the largest gyratory crusher made was the No. 9, which had a receiving opening of about 20 in. About that time the writer met Leigh Hunt, consulting engineer on

cement plants, who asked whether or not a gyratory crusher could be manufactured to break limestone "as large as a desk." A gyratory crusher with a 36-in. receiving opening was suggested but because there were no designs available, it was impossible to give Mr. Hunt a firm bid on this machine, the largest gyratory ever contemplated. The agreement reached was to sell the crusher at a specified price per pound, and the writer had every opportunity to design the best and strongest crusher possible. The order, placed by Mr. Hunt, consisted of two crushers, one for a cement plant in Des Moines, Iowa, and the other for a cement plant in Chattanooga, Tenn.

The success of this original 36-in. crusher greatly increased the demand for large gyratories to reduce hard rock and ores; in answer to which the crushers were continually made larger and larger in sizes 42-in.—48-in.—54-in. and 60-in.

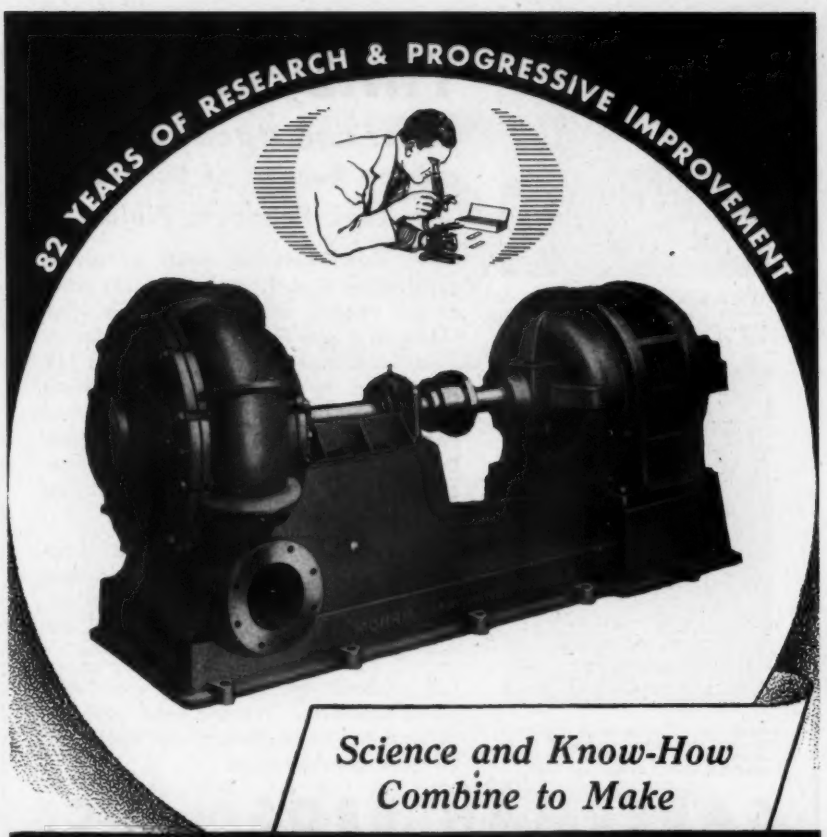
In 1919, a 60-in. gyratory crusher was designed for crushing limestone. This machine has crushed 60,000 tons a day and in one season has handled over 11,000,000 tons.

The history of jaw crushers is similar to that of the gyratory, but not as spectacular. The first successful machines were of the Blake type, developed about 1875. The frames were of cast iron and for many years the largest jaw crusher manufactured had a receiving opening of 24-x 36-in.

About 1915, we had the privilege of designing a jaw crusher with a receiving opening of 60-x 84-in. This machine had to be designed to crush the hardest known trap rock. This was the fore-runner of many large crushers which have been built. Crushers with receiving openings 48-x 60-in. and 56-x 72-in. are practically a common primary crusher in many of the large quarries. The largest crusher of this type had a receiving opening of 66-x 86-in. These large crushers were usually made of cast steel, sectional—two side-frames and two end-frames, due to shipping and handling. The 48-x 60-in. crushers, however, are made in one piece.

As the welding technique developed, it was again the writer's privilege to design jaw crushers of all-welded steel construction. The first crusher which he designed was about twelve years ago and since then many machines of welded steel construction have been made in all sizes, from the smallest, 8-x 12-in. receiving opening, up to a receiving opening of 56-x 72-in. These crushers are also made sectional with side-frames and end-frames separate for easy handling and to allow for these crushers being placed underground in mining operations.

We see great advances for the future and hope that we will have the privilege of seeing some of the ideas which are now formulating being incorporated in crushing machinery.



Science and Know-How Combine to Make

MORRIS DREDGING PUMPS

Outstanding in the Field

● Backed by 82 years of continuous research, field experience and progressive improvement, Morris Dredging Pumps have a long history of outstanding performance in handling highly abrasive materials. They are especially economical in pumping sand and gravel, and in general dredging service where the material is to be delivered to high elevations, or through long pipe lines.

Designed for Minimum Maintenance and Maximum Life

Design is simple and rugged, conforming with the best modern practice. Morris Dredging Pumps expressly designed for high vacuum, permitting dredging to greater depths, and pumping a higher percentage of solids. Impeller is of large diameter so that the pump will run at comparatively low speeds even when operating at high heads. Proper relationship between the shell and impeller designs produces a smooth, easy flow of material without eddies, turbulence or excessive friction losses— thereby reducing wear, abrasion and power consumption. When long service makes renewal of any part advisable, the design permits quick replacement at low cost, with only slight interruption of service.

Morris has comparative data on performance of all sizes of dredging pumps. Let our engineers recommend the type and size best suited to your needs. No cost. No obligation.

MORRIS MACHINE WORKS
BALDWINSVILLE, N. Y.
Branch Offices in Principal Cities

MORRIS CENTRIFUGAL PUMPS



This Sauerman Slackline Cableway is moving gravel from a wet pit 90 ft. deep, delivering direct to screens at cost of only few cents a cubic yard.



Above is a typical small Sauerman Scraper installation producing 40 to 50 cu. yd. an hour and for a portable screening plant. Simple and sure.

TIME TESTED

Sauerman Machines Have a Long Record of Success in Rock Products Field

More than thirty-five years of giving satisfaction at rock products plants is the proud record of Sauerman Slackline Cableways and Power Scrapers. An increasing number of these machines are being put to work this year moving materials from pits, banks and rivers, handling stockpiles, and stripping overburden. The popularity of Sauerman machines is at a new high throughout the industry.

Sauerman machines dig, haul and dump in a continuous cycle. The operator has easy control of the entire operation. Power demand is moderate. Repairs are few and simple.

Tell us about your excavating and stockpiling problems. We will send you our catalog and suggestions of our engineers for your consideration.

SAUERMAN BROS., INC.

530 S. Clinton St. — *Power Scrapers & Cableways* SINCE 1909 — Chicago 7, Ill.

Brownhoist Buckets for faster material handling

The deep-digging, hungry mouths of Brownhoist Clamshell buckets speed up the handling of coal, ore, gravel, dirt, cinders, clay, etc. Large sheaves reduce rope wear and maintenance. Sturdy construction and latest design insures long life. Available in rope-reeve, power-wheel and link type. Industrial Brownhoist Corporation, Bay City, Michigan. Offices in New York City, Philadelphia, Pittsburgh, Cleveland and Chicago.



Blasting

(Continued from page 105)

While no detonator should ever be called safe, the Manasite detonator gives a margin of safety not previously known.

"The company also developed important improvements in blasting machines to furnish portable current supply for field operations. The shunt-wound blasting machine was an important advance in quarry blasting. Of course, detonators and blasting technique are now developed so that the use of small power plants for firing up to 2000 caps is not uncommon.

"The latest development of great significance was introduced only last year under the trade name of Rockmaster. This constitutes a system of blasting using a special type delay blasting device along with changes in loading, spacing of burdens, and the selection of appropriate explosives. The Atlas Rockmaster system of blasting brings to a new pinnacle of achievement the safety, effectiveness and economy of electric blasting. The system acts as the starting point of a series of unique blasting devices which permit a hitherto unrealizable control of the action of explosives' gases. These blasting devices permit the use of a multiple-phase delayed initiating impulse. The system of blasting has consistently given better fragmentation, controlled back break and reduced vibration. Complaints due to noise and concussion have been drastically reduced, a factor of particular importance where blasting must be done close to a settled area.

Mechanization Influences

"The development of horizontal drilling in many quarry operations has made cost reductions possible and here changes in cartridging and loading methods have been necessary in the application of explosives.

"The development of new-type loaders and the use of existing-type loaders in place of shovels also places more burden on the explosives, because it is necessary to have rock properly blasted in order to secure efficient results with newer loading techniques.

"In some operations, there seems to be a trend toward mining rather than open-pit methods and the rock products industry therefore needs modification of its blasting methods in the future. Some of these problems have been solved in other industries and are merely to be adopted by the rock products industry, but in most cases, there is a place for some special new developments."

Ask Dredging Permit

LAKE ERIE SAND & TRANSPORT CO., Sandusky, Ohio, has requested permission to dredge sand and gravel from the Maumee river and bay near Toledo, Ohio.

FINANCIAL

RECENT DIVIDENDS

Alpha Portland Cement Co.	$ .25	June	10
Canada Cement Co., Ltd., 6½% pfd. (arrears)	1.62	June	20
Lehigh Portland Cement Co.	.25	May	1
National Gypsum Co., $4.50 pfd.	1.12½	June	10
Pacific Coast Aggregates, Inc., cv. pfd.	1.12½	April	15
Riverside Cement Co.	1.25	May	1
U. S. Gypsum Co.	.50	July	1
U. S. Gypsum Co., pfd.	1.75	July	1

•

PETOSKEY PORTLAND CEMENT CO., Petoskey, Mich., had a net income of $33,294 for the year ended December 31, 1945. This compares with a deficit of $33,004 for 1944. Net sales in 1945 were $1,824,110 as compared with $1,190,989 in 1944.

•

RIVERSIDE CEMENT CO., San Francisco, Calif., had a net profit of $275,439 for the year ended December 31, 1945, after taxes and depreciation. This compares with $140,622 for the year 1944.

•

MONOLITH PORTLAND CEMENT CO., Los Angeles, Calif., showed a net profit of $1435 for the year ended December 31, 1945, as against $93,356 for the year ended December 31, 1944.

•

ALPHA PORTLAND CEMENT CO., Easton, Penn., reported a very substantial improvement in earnings with a net profit of $437,634 for the year ended March 31, 1946, as compared with $8436 for the year ended March 31, 1945. Net sales for the year ended March 31, 1946, were $7,582,578 as against $4,911,711 for a like period ended March 31, 1945. President F. G. McKelvey said in his report to stockholders that the outlook for the company is more promising than in several years, but he expressed concern over the continuance of the coal strike as six of the eight plants operated by the company use bituminous coal.

•

DOLESE & SHEPARD CO., Chicago, Ill., reported a net profit of $46,694 for the calendar year 1945 as compared with $36,081 for 1944. Sale of the sand plant in January, 1945, for $15,738 resulted in a profit of $6211. President A. R. Hock expressed the opinion that an increase in agricultural limestone was anticipated, but labor difficulties in major industries and government restrictions on other than low cost houses may defer resumption of postwar heavy construction. However, once this construction is released a heavy volume of sales should result.

•

SOUTHERN PHOSPHATE CORPORATION, New York, N. Y., had a net income of $143,592 for the year ended December 31, 1945, as against $161,278 in 1944.



HAMMOND

MULTI-WALL PAPER BAGS



If you are critical about cement bags—you'll appreciate the fine qualities of Hammond Multi-Wall Bags. They're easy to fill, handle well, and most important of all, they're tough and are built to take a beating. They'll carry the load dependably from your Pack House to the job.

HAMMOND MULTI-WALL BAGS are carefully engineered to meet your most exacting requirements.

SEWN and PASTED BAGS for
ROCK PRODUCTS, FERTILIZERS,
PIGMENTS and HEAVY CHEMICALS

HAMMOND BAG & PAPER CO.
Paper Mill and Bag Factory
WELLSBURG, W. VA.

UNIVERSAL VIBRATING SCREENS

give best results

Guaranteed to give you best results on your most difficult separations. UNIVERSALS are of rugged yet simple construction, lowest in first cost and in maintenance. UNIVERSALS have been tried and proved in 25 years of dependable service.

Write for 32-page catalog on screens and screening.



Type "MR" 42"x96" Double Deck

★ ★ ★ UNIVERSAL VIBRATING SCREEN CO. ★ ★ ★
RACINE — WISCONSIN

DO YOU OPERATE AN $18,000 BUCKET?

If you operate an $18,000 crane on *bucket work*, you most certainly operate an $18,000 bucket, for your entire crane investment during that period depends upon the efficiency of the bucket. We know a contractor who operated a used ½ yd. bucket when an analysis of the job and crane called for a ¾ yd. bucket. *In ordinary excavating work he lost 10 cu. ft. of pay load on every bucket cycle.* Do a little figuring or better yet, wire us collect the capacity of your crane, the boom length, and the material handled. We'll give you facts that will mean more profits on bucket work—help you get the most out of your crane investmeat on bucket work.

ERIE STEEL CONSTRUCTION CO.

766 GEIST RD., ERIE, PA.

BUCKETS • AGGREMETERS • PORTABLE CONCRETE PLANTS

KILN END **Burn-Outs** KILL PROFITS

PYRASTEEL
KILN ENDS

. . . prevent costly burn-outs and shutdowns that result in serious loss of production.

Install PYRASTEEL Segmental Kiln Ends at *both* the discharge and feed ends of your cement kilns, and be assured of long, dependable, and economical service.

Write for Bulletin of This Heat-Resisting Alloy



Showing discharge end of cement kiln fitted with PYRASTEEL Segmental Kiln Ends.



Unit segments are easy to install or replace.

CHICAGO STEEL FOUNDRY COMPANY
PYRASTEEL for high temperatures
KEDZIE AVE & 37TH ST
CHICAGO 32, ILL.
Makers of Alloy Steel for 33 Years
EVANSTEEL for strength

Manufacturers' News

L. B. Foster Co., Pittsburgh 30, Penn., has elected the following vice-presidents: L. S. Barry, in charge of the New York Branch; Henry E. Fleishman, office manager of the Chicago branch; Glenn Morrow, head of pipe operations, and E. J. Shellaby, sales manager of the Pittsburgh office.

Gar Wood Industries, Inc., has appointed Ross Miller as manager of the Pacific Coast factory in San Francisco, Calif.

John A. Roebling's Sons Co., Trenton, N. J., announces that Ferdinand W. Roebling III has been appointed vice-president in charge of engineering. He succeeds Charles M. Jones, who has become vice-president in charge of public and industrial relations. Both are members of the board of directors. Fred J. Maple, formerly manager of advertising, has been named manager of exhibits. He is a member of the board of directors, Exhibitors Advisory Council, Inc. Albert Neroni will succeed Mr. Maple as manager of advertising.



F. W. Roebling III

Mr. Roebling is the third great-grandson of the company's founder, John A. Roebling, now actively engaged in management, the others being Charles R. Tyson, president, and Joseph M. Roebling, chairman of the board of directors. Upon his graduation from Princeton University in 1933, Mr. Roebling became a member of the engineering staff and continued in that capacity until called to active military service in 1940. He recently returned to the company after serving with the U. S. Army Engineers for five years, and retains the rank of Lieutenant Colonel in the Officer Reserve Corps.



Charles M. Jones



Albert Neroni

Mr. Jones is a graduate of the U. S. Naval Academy, and also attended Massachusetts Institute of Technology. He joined the Roebling staff in 1926 and has held many positions of responsibility within the company. He is a member of the board of directors of both the Trenton and State of New Jersey Chambers of Commerce.

Marion Steam Shovel Co., Marion, Ohio, has changed its name to Marion Power Shovel Co., at a recent stockholder meeting. All directors were reelected. They are E. G. Diefenbach, chairman of the board; M. E. Montrose, president and general manager; John M. Demarest, vice-president and works manager; Alex Gibson, vice-president and treasurer; John P. Courtright, vice-president in charge of sales and service; Harvey T. Gracely, vice-president; M. Virden, secretary and assistant treasurer; Walter C. Kraft, assistant secretary; Newton B. Schott, assistant secretary.

Caterpillar Tractor Co., Peoria, Ill., announces the retirement of Carl O. Wold as a vice-president of the company after 40 years of service with the Russell Grader Mfg. Co. and Caterpillar Tractor Co. He was executive head of the Russell organization until it was acquired by the tractor company.

Worthington Pump & Machinery Corp., Harrison, N. J., announces the appointment of George E. Gates as a staff member of the Worthington-Ransome Construction Equipment Division, with headquarters at San Francisco, Calif.

Vulcan Iron Works, Wilkes-Barre, Penn., has announced the appointment of Mark R. Woodward as director and Leon D. Holden as assistant director of the newly created Cement, Lime and Allied Products Division to design and construct complete plants for the manufacture of cement, lime, etc. Mr. Woodward was formerly assistant chief engineer of the Lehigh Portland Cement Co., manager of the Chicago office of the cement division of Babcock & Wilcox Co.; and chief engineer of Marblehead Lime Co., Chicago, Ill. For four years prior to joining the Vulcan staff Mr. Woodward was chief engineer and head of the maintenance and power departments of the Plum Brook Ordnance Works. Before entering the cement manufacturing field, he was an engineering expert aide in the U. S. Navy Department, Bureau of Yards and Docks



Mark R. Woodward



Leon D. Holden

Mr. Holden served for two years as engineer for the New York Trap Rock Corp.; resident ship engineer for the Chicago Bridge & Iron Co. for two years; design engineer for the Lehigh Portland Cement Co. for 18 years; and division engineer for the DuPont Co. for one year.

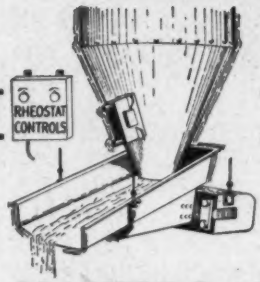
Gar Wood Industries, Inc., Detroit, Mich., announces the election of Charles W. Perelle as president of the company. He succeeds Glen A. Bassett, who has retired. Mr. Perelle was formerly vice-president in charge of manufacturing of Consolidated - Vultee Aircraft Corp. He is regarded as one of the outstanding production men to have been developed by the war and installed the first mechanized assembly line in the aircraft industry. As vice-president of Convair, Mr. Perelle was responsible for the production of more than 30,000 military aircraft, including the famous four-motored B-24 Liberator bomber.



Charles W. Perelle

Hewitt Rubber Corp., Passaic, N. J., has changed its name to Hewitt-Robins, Inc. The change was announced by Thomas Robins, Jr., president. All officers were reelected. Harold H. Von Thaden, first vice-president of Robins Conveyors, was elected a director of Hewitt-Robins, Inc.

HAVING
MATERIAL HANDLING
TROUBLES?



SYNTRON

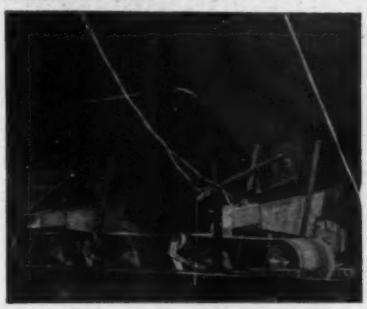


"Pulsating Magnet"

ELECTRIC VIBRATORS

—to assure free-flowing bins, hoppers and chutes, by breaking down, arching and plugging—without damage to prime equipment.

3600 rheostat-controlled vibrations per minute.



"Vibra-Flow"

VIBRATING FEEDERS

—with their rheostat-controlled flow of practically every kind of material —from stone and ore down to fine powders—hot or cold—dry or moist—at rate of from a few pounds to 500 tons per hour.

PROVIDE THE EASY, ECONOMICAL
WAY TO HANDLE MATERIALS

Write for catalog data

SYNTRON CO., 450 Lexington, Homer City, Pa.

MANGANESE STEEL
CASTINGS

for
PULVERIZERS
CRUSHERS
ROLLS
SCREENS

for
SHOVELS
DREDGES
CRANES
CONVEYORS

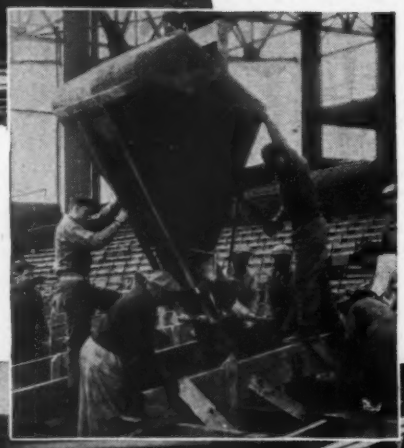
The Frog, Switch & Mfg. Co.
Established 1881
CARLISLE, PA.

HERE'S WHY THEY ASK FOR 'INCOR'



'INCOR'

WINS OPENER AT EBBETS FIELD







DEPENDABLE 'INCOR' HIGH EARLY STRENGTH SAVED VITAL DAYS

WHEN customers say, "We want 'Incor' concrete," you can be sure they need it —to save time . . . to make one form set do the work of two or three sets with ordinary cement . . . to get earlier occupancy or use. 'Incor', America's *first* high-early Portland cement, assures one-day stripping strength *with standard mixes*—and with time and forms costs at an all-time peak, resulting 'Incor' economies are greater than ever before.

Alterations at Ebbets Field, home of the Brooklyn Dodgers, extended the grandstand to playing-field level, providing nearly a thousand additional box seats. The job had to be completed in time for the big pre-season series with the N. Y. Yankees. Caisson & Foundation Corp., Bronx, N. Y., used ready mix 'Incor' concrete from the Cranford Company, Inc., Brooklyn, N. Y. Hardesty & Hanover, New York City, were the Engineers. Dependable 'Incor' early strength beat cold spring-night frost hazards, speeded completion with minimum forms, saved days when time counted plenty!

Jobs like this explain why leading Ready Mix Operators make 'Incor'* 24-Hour Cement available at all times, as part of their good service.

*Reg. U. S. Pat. Off.

LONE STAR CEMENT CORPORATION

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LONE STAR CEMENT, WITH ITS SUBSIDIARIES, IS ONE OF THE WORLD'S LARGEST CEMENT PRODUCERS: 15 MODERN MILLS, 25,300,000 BARRELS ANNUAL CAPACITY



ROCK PRODUCTS'

CONCRETE PRODUCTS

and Cement Products

JUNE
1946

Storage yard of Price Bros. Co., Dayton, Ohio, showing 275,000 ft. of Flexicore slabs on order for 35 different jobs



Engineered PLANT DESIGN

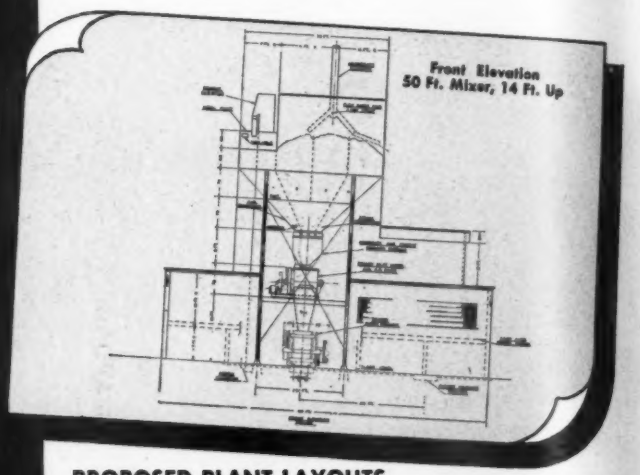
For More Efficient Operation



Plants for producing concrete masonry units must be "tailor-made" to fit local conditions. That's why leaders in the industry look to BESSER for complete engineering service.

Every BESSER designed concrete masonry plant is backed by a rich heritage of more than 40 years of specialized experience in this field. In designing a plant, BESSER engineers take into consideration the kind of materials available . . . the topography of the land . . . material handling methods . . . potential plant output . . . space for storing blocks . . . and many other factors.

When completed, a BESSER designed plant meets the needs for speed and economy, and produces PROFITS for the owner.



PROPOSED PLANT LAYOUTS — BESSER SUPER VIBRAPAC

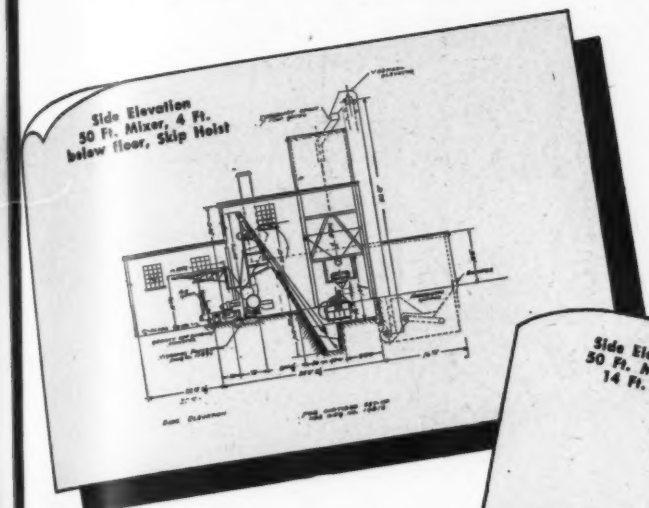


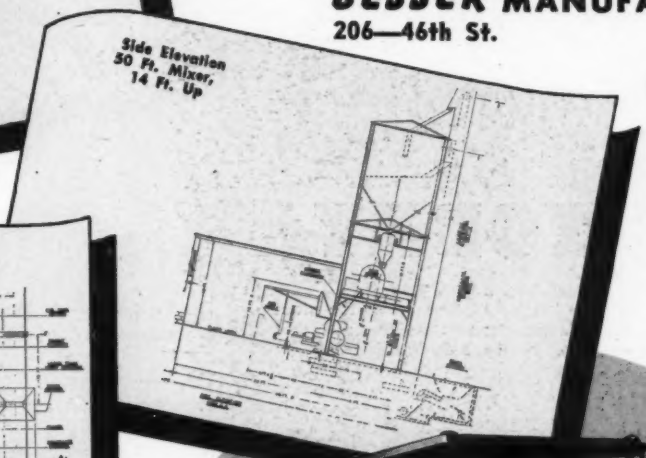
Besser awards include both the Minute Man and Navy E Flag.

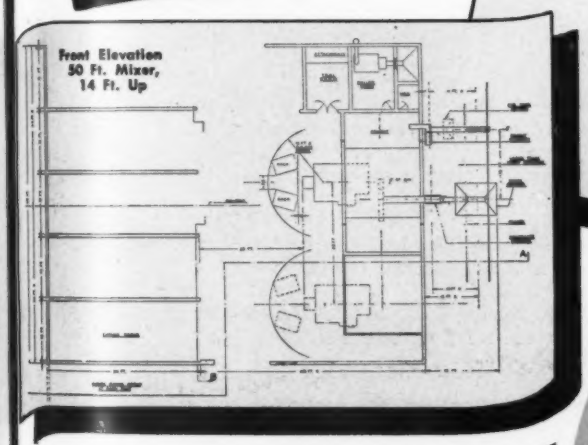


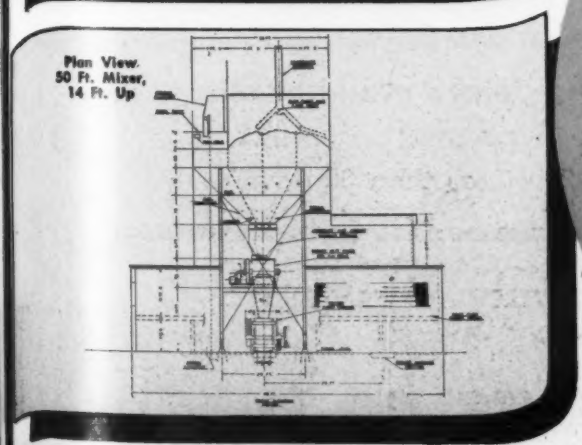
ANOTHER BESSER *First!*

Plant Layout Engineering Service









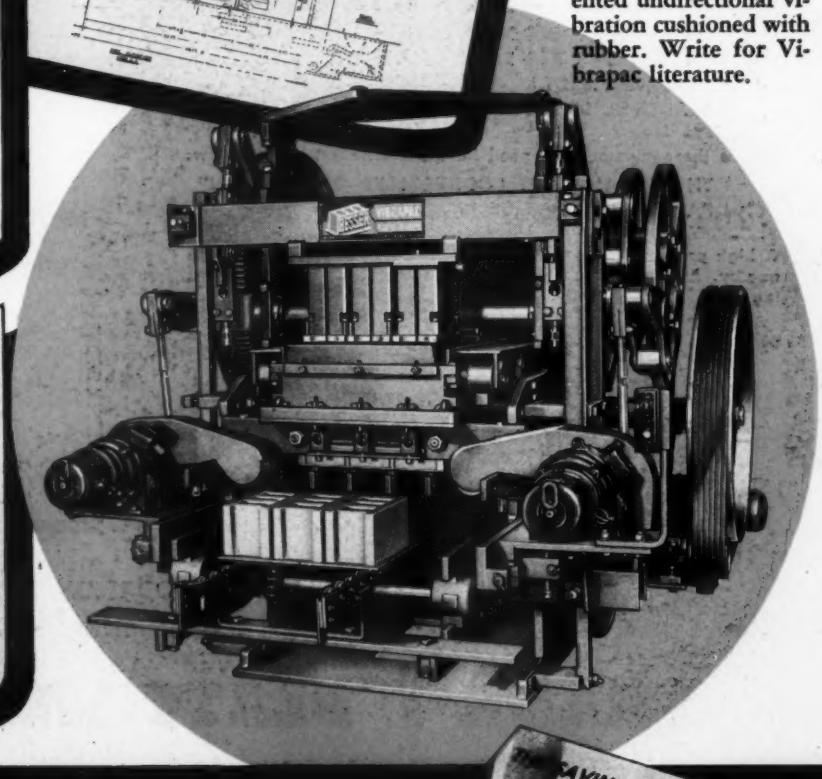
Every concrete masonry plant is DIFFERENT! The location of the plant, its layout, facilities, etc., must be properly planned, in order to be both efficient and profitable. That's where experienced BESSER Engineers come in as a "FIRST". For Plant Design Engineering has been a special BESSER service for more than twenty years.

If you have a plant layout problem, regardless of size, call in a BESSER engineer. He will gladly consult with you and give you the benefit of his broad experience in this field.

BESSER MANUFACTURING CO.
206—46th St. • ALPENA, MICH.

BESSER Super Automatic Plain Pallet Vibrapac

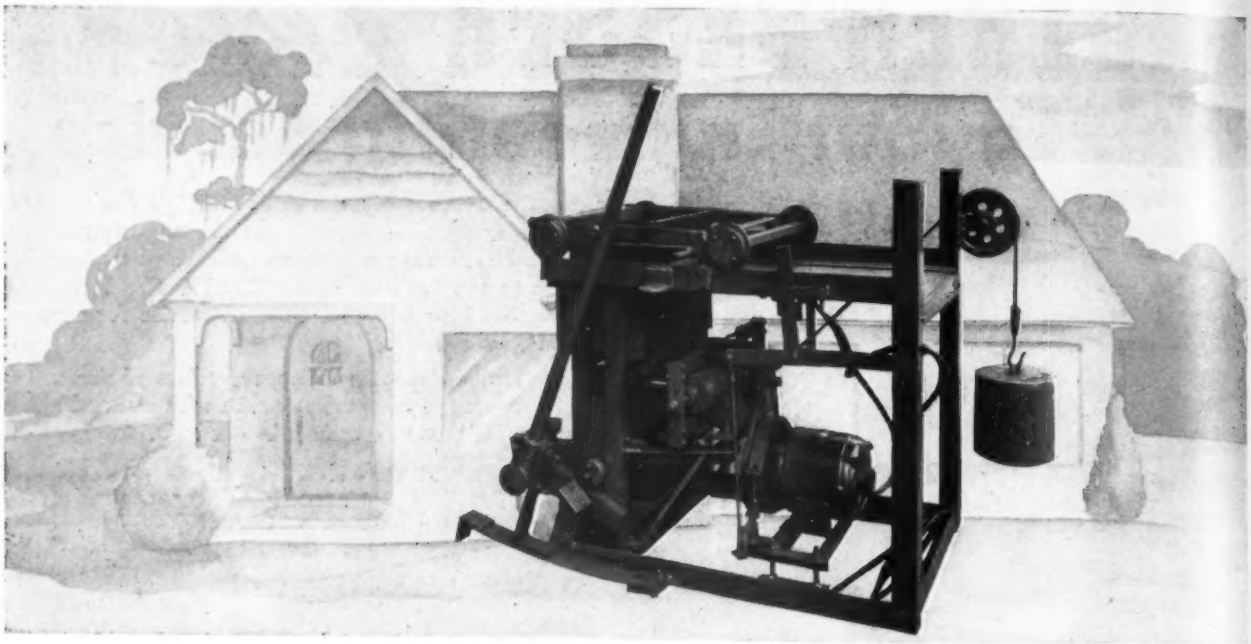
Automatically turns out 600 — 8" x 8" x 16" blocks per hour—three at a time. All sizes and shapes of blocks made on one set of plain pallets. Density and texture controlled by patented undirectional vibration cushioned with rubber. Write for Vibrapac literature.



THE SAVING IN PALLET COST WILL PAY FOR A BESSER VIBRAPAC PLAIN PALLET STRIPPER

VIBRAPACS . . .

The Blatt System Block Plant of TOMORROW



HERE TODAY

The Blatt System begins with the block and then builds the plant which will produce this beautiful, high-strength building material. This is the kind of block produced by the Blatt System:

WATERPROOF BLOCK
MORE BLOCK PER SACK OF CEMENT
STRONGER BLOCK
BEAUTIFUL BLOCK

This is the equipment you need for the Blatt Plant of Tomorrow:

THE KISSAM-BLATT "CONTROLLED OSCILLATION" PATENTED CONCRETE BLOCK MACHINE

A high production, precision built machine, built to produce high quality, high strength block. Check these superior operational features:

CONTROLLED OSCILLATION
PRECISION BUILT FOR LONG LIFE
A FASTER MACHINE
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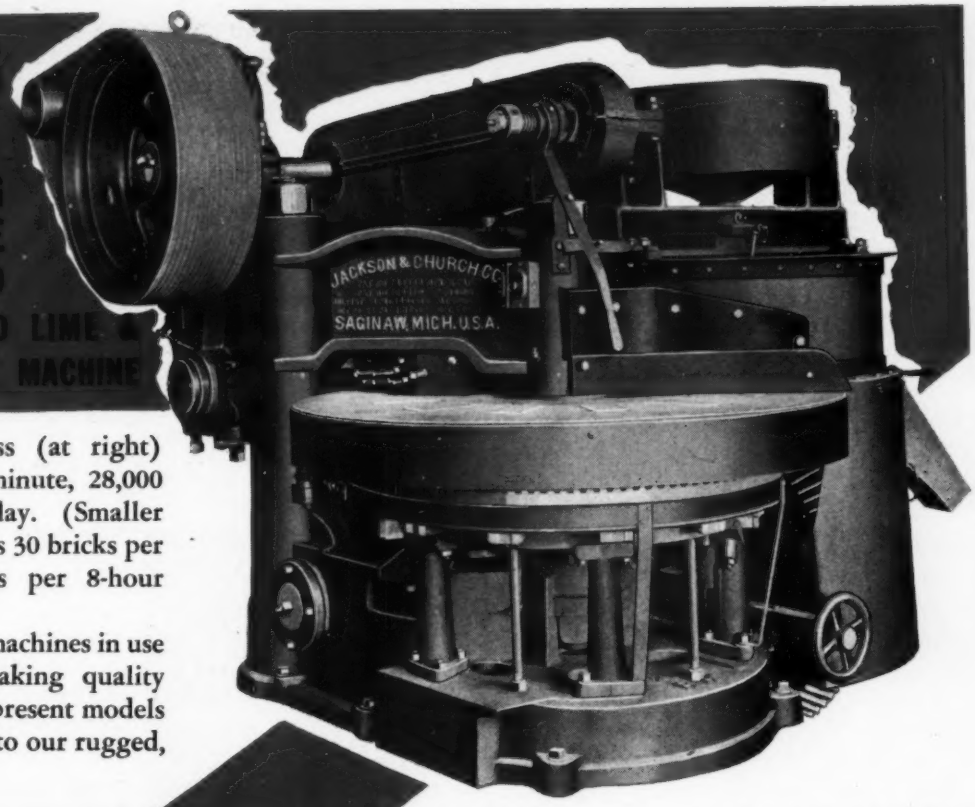
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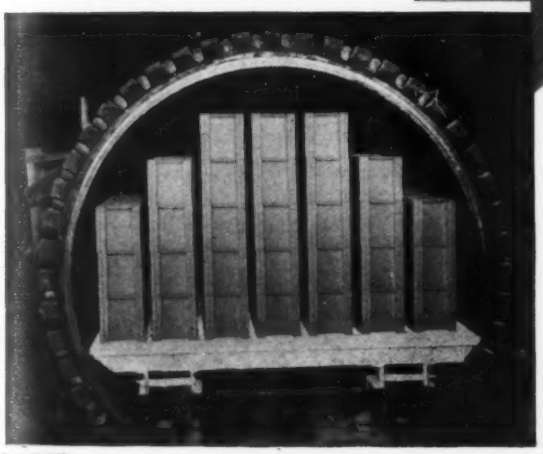
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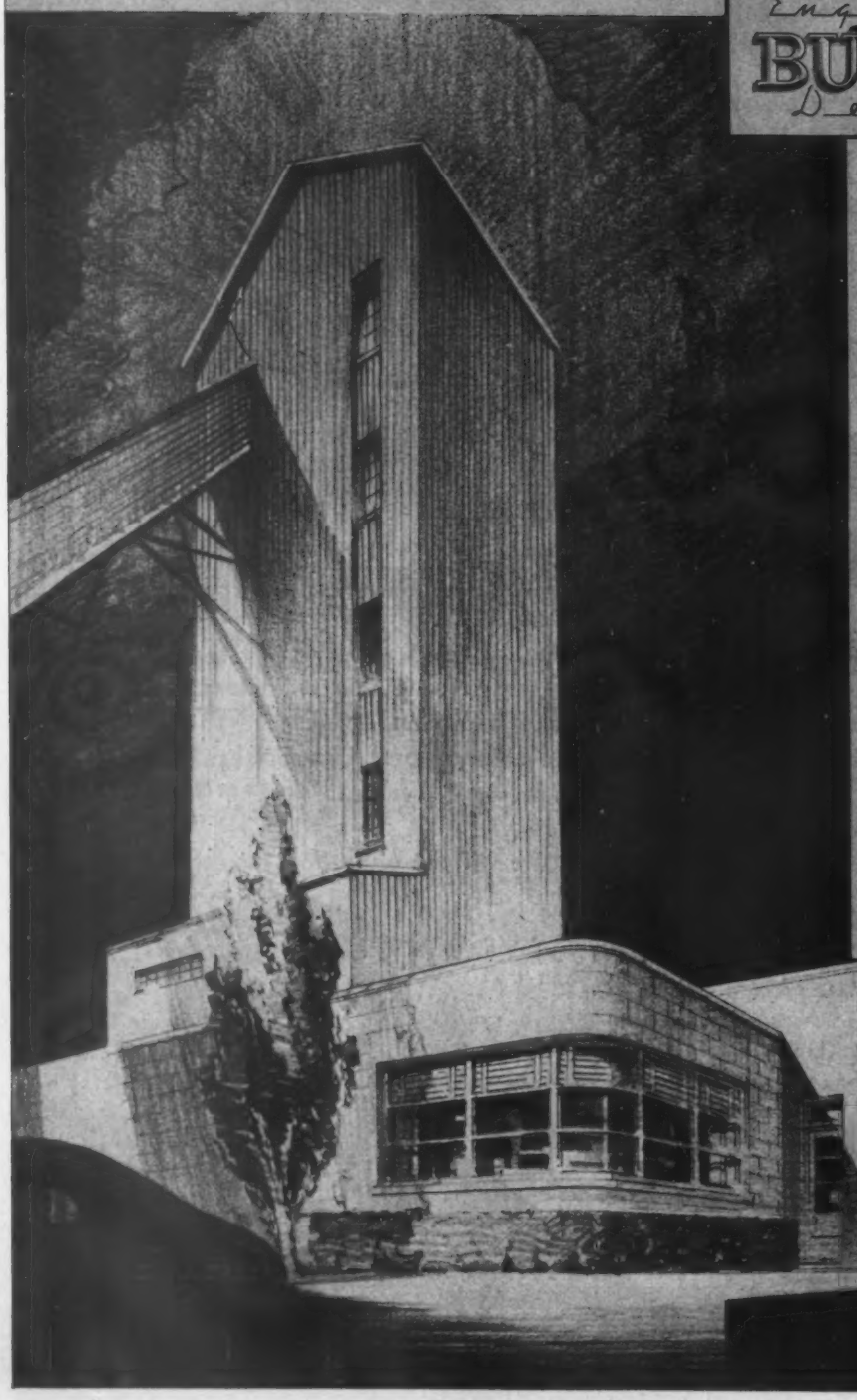
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Fifty Years of Concrete Products

Unusual developments in the evolution of concrete traced through 50 years in Rock Products

By BROR NORDBERG

As this is the 50th anniversary of ROCK PRODUCTS, two of its component parts being CEMENT and ENGINEERING NEWS founded in 1896 and CONCRETE PRODUCTS, purchased in 1918 and absorbed into the parent magazine in 1936, it is our purpose in this article to trace the evolution of the concrete products industry over the past fifty years.

After thumbing through thousands of pages in our bound volumes of ROCK PRODUCTS and CEMENT and ENGINEERING NEWS, which dates back six years earlier, it soon became apparent that time and space would permit but a sketchy treatment herein. However, we hope our effort has more than historical interest. It certainly has meant more than that to us; in fact it is our conviction that an editor just isn't up-to-date unless he knows what his industries have accomplished from their beginnngs. Much that he and his readers consider new isn't new at all, but possibly just an adaption or a copy of what members of his industry did 40 or 50 years ago.

Both publications had a profound influence in development of the early concrete products industry for they and manufacturers of machinery and equipment actually were the only sources of information available at the turn of the cefitury; technical and scientific organizations and associations came later.

History Repeats Itself Today

The concrete products industry is an old but yet a young business. It is old in the sense that its beginning and early development dates before the time of the concrete pavement and mass concrete construction, and parallels the development of the portland cement industry. It is young because the industry is now in process of pronounced growth and perfection, both in product and plant, and because very few individuals now in the business date back very far in years. As compared to the rock products and portland cement industries, executives are, in general, young men. Very few concerns, or their predecessors now in business were evident in print until at least the mid 20's. Therefore, in touching upon some of the old landmarks, we believe many of the facts will be news to the majority.

Certainly, the fact that conditions paralleling those of today existed years ago—a great influx of new competitive enterprises, union difficulties, code problems, etc. — should interest newcomers and newcomers-to-be in the industry. There evidently were two major cycles when great numbers of new concerns entered the business. Economic and competitive conditions, in each case, were the adjusting factors. The first such period was from about 1900 to 1907, the latter being a depression year, but during those years great expansion was justified and encouraged. There was plenty of portland cement but lumber and other building materials were scarce and high in price, and a new industry was being born to satisfy a great need. Machinery manufacturers sprouted up and the editors in the trade encouraged, in fact pleaded, for new enterprises. A few thousand concrete masonry plants resulted. The editors couldn't find space to publish all the news on plant development and had to confine themselves merely to listing new plants by states. We will probably have to do that soon.



Hand-tamping concrete into block (Palmer) molds. Three men were required to make concrete block in those days

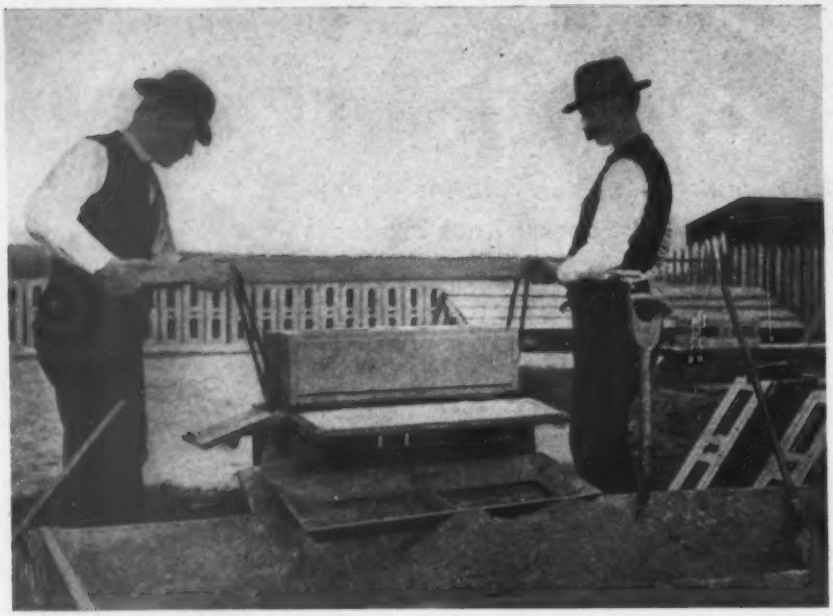
The depression took care of many of these small operators, the majority of whom manufactured a not-too-good product and, by the time the U. S. entered World War I, there were some 600 to 700 plants manufacturing concrete masonry units. The second big influx of new plants started shortly after 1918 and the process of levelling off was repeated. It was extremely interesting to study the news columns and the advertising pages of the magazines during those two periods when new machines came into being over night, each claiming great advantages over the other. And, it seemed that all the machinery manufacturers in the 1900-1907 period were suing each other for patent infringement.

Nevertheless there were some keen thinkers in the early days of the industry, long before benefits of research were available, and some clever units were developed for building, in attempts to minimize water penetration through walls. Several such units are shown herewith, one of which we understand is similar to a unit now under consideration as a new idea. These units feature continuous air spaces.

The concrete masonry industry, when production capacity again exceeds demand, could well give consideration to the versatility of products manufactured by their predecessors in the early 1900's. A tremendous variety of concrete units and specialties were manufactured, many of which could profitably be made as a sideline, or possibly as the main products by some who insist upon entering the concrete products industry with far too modest capital. These products will be discussed later in this article.

Concrete Bath Tubs and Prestressed Units

Many products considered new in recent years are not actually new. Precast concrete bathtubs, for example, were manufactured almost 50 years ago and of a quality to "resist steam and heat." Prestressed units were known almost 50 years ago according to our record. And, many early plants were capitalized for sums of several hundred thousand dollars, which compares with capitalization of many firms today even with their highly inflated dollars.



Two men were required to strip hand-tamped concrete block from mold in the early days

Today, practically all emphasis is placed by too many on the big volume sellers such as concrete building block or concrete pipe. Other units made in the past have represented important volume. The balance of this article will be sketchy, for a chronological record of important developments and new product introduction is simpler to follow. Our treatment is by no means complete and will consist of a series of more or less disconnected incidents as they arise.

P.C.A. Research Started in 1916

The industry had its hectic days and those who gain their livelihood in it today should give credit to those who put up such a gallant fight 50 years ago to get started against tremendous obstacles and to those who insured a future for the industry through research and promotion that gained headway from about 1916. Until the Portland Cement Association started its scientific research program in that year, private testing laboratories and those of the cement companies had done what research was available.

Production of portland cement was only about 2,000,000 bbl. just before the turn of the century and it grew to over 40,000,000 bbl. in 1906, a period during which much took place toward the development of the concrete products industry. Concrete sidewalks were stressed heavily by the cement industry prior to that period.

Early Concrete Pipe for Sewers

The value and need for industry organization to combat other interests was soon found. The city of Brooklyn, N. Y., had used concrete sewers since 1861 and the city of Milwaukee since 1881. As a matter of interest, concrete pipe for Brooklyn's sewers were hand-made until 1890 of a mix of 1½ cement: 1 of sand: 3 of trap rock with 20 percent stone dust and 10 to 15 percent of water. Method of measure was not specified in the article. The question of substituting concrete for brick in Chicago's sewer system was agitated in 1896 because prices of brick were raised too high by the "brick trust" and was almost adopted but the brick men smothered this early attempt. The cement interests were found too scattered to affect positive legislation in their own interest. At this time Racine, Wis., and Milwaukee, Wis., had two plants manufacturing sewer and culvert pipe in large sizes with flat bases to facilitate laying. Three-foot lengths were standard with 15-in. sockets, and egg and oval forms were the most desirable.

In 1896 an account was published of the manufacture of kitchen trays and bathtubs of precast concrete without "seams."

First Concrete Block

Harmon S. Palmer generally is credited with the development of the first commercial process for concrete block manufacture. He had been experimenting on a machine since 1890 and soon after was awarded a patent covering hollow concrete building block as such.

A dwelling built of Palmer's hollow concrete block was described in an article published in 1897. The units, which incidentally measured 30-x 8-in. and 10-in. thickness of portland cement and sand, were made at the jobsite to save cartage and breakage in handling. They were of tongue and groove design with interlocking joints, and had recesses provided for installation of doors and window sash. A unit had the surface area equivalent to 40 ordinary clay brick and had to be set in the wall with the help of a hand-cranked derrick.

A horse and wagon were required to haul the machine to the job, and two men could make 80 block per day. Five men could make 200 per day. The machine was a simple affair consisting of a lugged mould box with movable side plates and movable cores and a removable bed plate. A hand ram or spud was used to ram a dry mix (hand-shoveled mix) into the mould. A turn of a hand crank withdrew the tapered cores and, as described in the article, the sides were opened and the block was exposed to view. The units were dried sufficiently until they could be stood on end in stockpile, pallets being removed after 24 hr., and an improvised roof was set over the pile to protect them from the sun. Cost of manufacture was 19c per unit including 5c for labor, 12c for cement and 2c for sand. There was of course, no overhead, transportation or other expense to speak of involved.

The machine was advertised as capable of making an "infinite variety of plain and ornamental block," provision having been made for insertion of a leaf within the mold box for pattern effects. The standard unit had 40 percent air space and, it was claimed, the inside wall could be made smooth for the application of wallpaper direct. Imagine how the interior of the house must have looked, with wallpaper applied to units of great porosity! Six buildings of Palmer's hollow concrete block construction were approved by the Building Department of the city of Chicago up to 1897.

For the next several years there appeared on the market a number of block machines similar in general type (hand tamp) but, of course, with some changes in detail and there followed an intense competition between machinery manufacturers. Mr. Palmer had secured a patent covering the product—hollow concrete building block—and sold his machine for $200 on a royalty basis with exclusive territorial protection. He had incorporated the Hollow Concrete Building Block Co. for $2,000,000 to establish plants for the manufacture of machines, in 1902, and by 1904 had 400 machines in operation.

Others putting machines on the market likewise advertised exclusive territory to licensees, and there developed an intense competition among these manufacturers to set up concrete products plants all over the country and a series of suits and counter-suits involving the original patent resulted. Mr. Palmer, in all his trade advertising over several years, offered a five dollar reward for

information about anyone making or laying hollow concrete block without authorization from him. He further offered to protect his licensees and help recover money lost to them due to infringement. He was upheld in early cases before the courts but, as in the case of many patents, they soon lost their value under fire and, after a few years, some 100 machines of the same general type were on the market.

Glowing pictures of big profits to be made were painted by these machinery men. In their advertisements they stated that 40 to 60 percent profits on sales of concrete block were common. They, and the early editors advised: "Go into the cement block business if you want to make money amid pleasant surroundings." With this kind of encouragement, in striking contrast to what could be said today, concrete block plants sprang up by the hundreds.

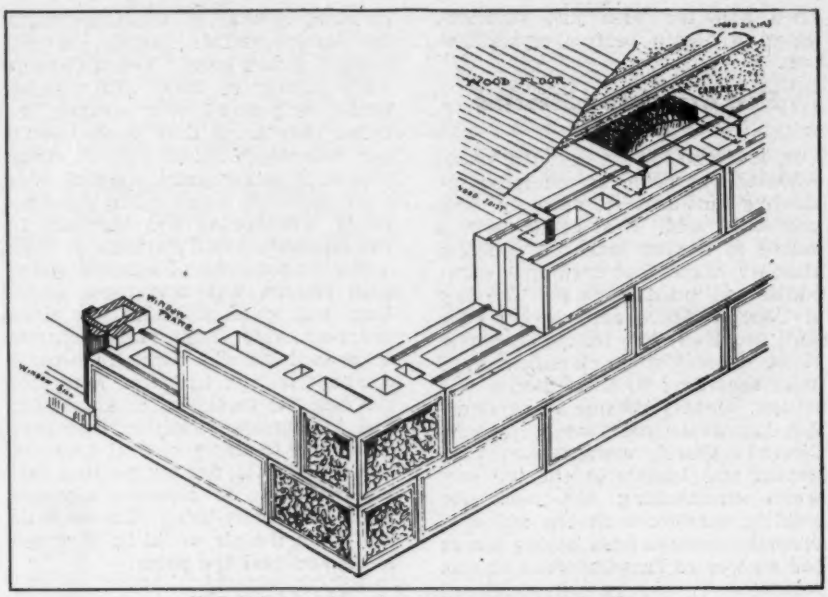
Quality of concrete units in those days was extremely poor and, being made as they were, the units could not be anything else but extremely porous. Yet they were sold for exposed walls, exterior and interior, for direct plastering or application of wallpaper without furring strips. They gained acceptance, regardless, despite the efforts of brick unions and other organizations that banded together to stifle this upstart building material. It was in 1902 that a labor agitator, president of the Bricklayers and Masons International Union, made a nation-wide tour in an attempt to enlist concrete workers into his union on the theory that if concrete masonry could not be downed the best thing would be to get the new industry into the fold.

It was announced in a 1904 issue that "bricks of real concrete" were being manufactured at the rate of 50,000 per day by the Cement Products Co., Wilmington, Dela., in the first plant built for exclusive manufacture of the product. Brick were sold for $3.50 per thousand and $5.00 for colored face brick. A barrel of cement and 1¼ cu. yd. of sand made 1000 brick.

Develop Specialties

In August, 1898, an item was published describing the manufacture of concrete posts for right-of-way railroad fences. These were made of rectangular section tapering toward the top with No. 10 2-wire cables under tension run from top to bottom for reinforcement. They were made in wood molds with a mix of one part cement to three of sand. A barrel of cement produced 18 to 20 posts that cost from 15 to 17c each to make.

In June, 1899, announcement was made of "Steven's Litholite Stone," an artificial portland cement stone, all done by hand work, and a development of the past 25 years. Mention

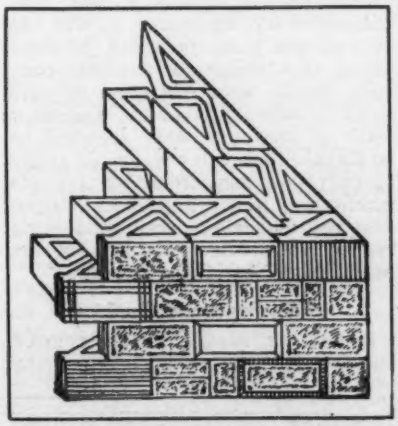


H. S. Palmer system of concrete masonry construction

was also made of the fact that concrete steps, with the riser and tread cast in a single piece, with tie rod and nut assembly, were being manufactured in Germany.

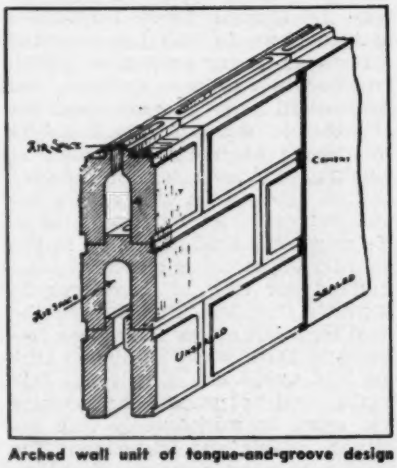
Two factories for making cement roofing tile were announced in 1901 and the Schall cement tile, manufactured under pressure in molds, was brought out. The use of concrete ties in 3-ft. lengths by the Pere Marquette railroad at Bay City, Mich., in an adaptation for crossings at paved streets is shown herewith as another illustration of the versatility of concrete as applied in the early days of the industry.

Great strides in the expansion of manufacture of hollow concrete units were recorded in 1903 with a "chain" of plants invading all sections of the



Pegram system of concrete masonry

country. High prices charged for lumber, steel and brick were important factors. It was predicted then that plants would become as numerous as brickyards and quarries. An architect's design for a 6-room house,



Arched wall unit of tongue-and-groove design

21 ft. by 32 ft., with basement, laid with concrete units, to sell for $2800 to $3200 was shown—in striking contrast with today's prices.

Concrete Burial Vaults

First mention of concrete burial vaults was in connection with an exhibition in 1903 at the Builders' Exchange in Worcester, Mass. They were described as having the property "for preventing escape of noxious gases from decomposing bodies." Concrete floor blocks were patented that year, the construction consisting of hollow concrete blocks to be slid between the flanges of I-beams.

An interesting advertisement was carried by the Stevens Cast Stone Co., Chicago, in February, 1903. It stated that nearly all artificial stone patents before 1897 were based on chemical solutions such as saltpeter, alum and lime water which resulted in injurious staining and that under the Stevens' process stone is nour-

ished and fed with just sufficient water to obtain perfect crystallization."

First Association Stressed Quality

In 1904 and for the next few years, evidence was being accumulated indicating that concrete masonry units had to be sold. Real estate owners balked at issuing loans on concrete masonry homes but insurance companies continued to do so. The city of Topeka, Kans., amended its code and provided for testing concrete block. A need for the classification of units according to their merits was arising. Quality became a consideration just about the time the annual Cement Users' conventions were started and leaders in the industry began emphasizing the need for building confidence in the industry, since the average man buying blocks had no way of knowing what he was getting.

O. W. Miracle, Miracle Processed Stone Co., Minneapolis, speaking before the Cement Users' convention at Ames, Iowa, in 1905, presented the first paper on the subject of quality recorded in our back numbers. He emphasized then that one bad job of concrete masonry would nullify the effects of many good ones in building confidence for the industry and its product— a fact that is being emphasized over and over today. He recognized that it was up to the industry to protect its customers, who suffered for lack of knowledge in products they buy. He stressed the need for moist curing for a week followed by three weeks additional curing and urged the industry to talk quality and not price. The industry was urged to work closely with insurance people and inspectors. The machinery manufacturer at that time was recognized as being much better informed than the concrete block manufacturer.

At this meeting, it was mentioned that up to six percent clay in the sand, with proper curing, would yield a unit of enhanced strength, but that such clay should not be one that would result in discoloration. It was urged that in metropolitan areas where brick interests were serious obstacles to the introduction of concrete block that concrete brick be pushed with the thought that acceptance of concrete block would follow. The Concrete Block Manufacturers Association was organized June 27, 1905, for the purpose of improving the quality of concrete block. A plea was made for standard specifications.

In that year there were 1600 concrete block plants and the standard size was the equivalent of 28 bricks laid in the wall. Some new designs of units were appearing, in an effort to combat the problem of water penetration, several of them providing for continuous air spacing (several designs shown here). Yet, architects were falling in line, with lumber prices 50 percent over normal, because they knew that people would buy concrete block in spite of them. The U. S. government adopted concrete masonry construction for hospitals, storehouses and barracks in the Philippines and Panama in 1905.

The intermixing of mineral colors with cement was introduced about then, and much attention was given water-proofing. Lime manufacturers advertised heavily, since it became common to mix hydrated lime into the concrete to cut water absorption and to increase strength. One proposal was to apply several coats of barium hydrate, five ounces to a gallon of water, to concrete masonry walls, the theory being that carbonic acid from the air would be absorbed to fill and seal the pores.

Machinery Developments

About 1905, the hand-ram type machine was superseded in a few instances by pneumatic tampers. The use of paraffin, animal or vegetable oils became necessary to facilitate stripping as attempts were made to change the mix in the manufacture of more dense units. The standard unit was 32-x 9-in. face or two square feet, made in 8, 10 or 12-in. thicknesses. These units, of a 1:5 mix with sand or stone screenings for aggregate, weighed 120, 150 and 180 lbs. respectively. Typical costs of materials for a production of 600 units daily were $60, plus $1.80 per day for each of 25 laborers plus $10 for repairs and $20 for office and miscellaneous. This amounted, for an average case, to 22½c per 8-in unit which sold for 30c.

The year 1905 saw many new developments in products and machinery while resistance to the use of concrete block persisted in some areas. In Chicago, for example, concrete blocks were restricted to one-story construction and basement walls of masonry were required to be thicker than brick walls. So many patents were being issued on concrete machinery, molds and block shapes that the magazines were conducting regular departments of five or six pages describing these patents.

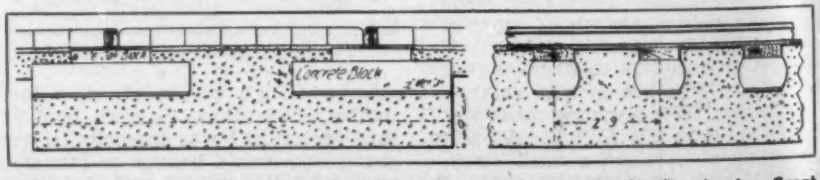
High Pressure Curing

In October, 1905, an article pointed out the possibilities of steam curing under high pressure based on experiences observed in sand-lime brick manufacture. It was predicted that the process would be effective in obtaining a complete cure in 3 to 4 hrs. But it was stated that the expense of curing equipment was too great. The author stated that the process would serve as a good soundness test since unsound cement would not stand up under this treatment.

The National Association of Cement Users at its second annual convention, in 1906, discussed air tamping, concrete architecture, waterproofing, causes for failures and machinery, giving a clue to problems that beset the industry. A number of State organizations began to arise and there was intense rivalry between cities to hold the national conventions. The second annual convention, was scheduled for Milwaukee, Wis., and, just in time to cause a mixup, an erroneous announcement came out that the meeting was scheduled for Columbus, Ohio, the same dates, with the result that many travelled to the wrong place. The editor who reported the incident was convinced there was foul play. Jackson, Mich., put in a bid for the 1908 convention and it was awarded to Chicago whereupon the Jackson representation decided to hold its own convention.

The San Francisco earthquake came along in 1906 and great capital was made of the fact that a 4-story building of concrete masonry in Oakland, Calif., was undamaged. Announcement was made of a plant in Birmingham, Ala., with a capacity of 800 units per day that had an overhead moist curing system, and the patent for a concrete block lifter (offbearer) was described. The cube mixers, consisting of a cube container revolved on a horizontal shaft were advertised as the last word in mixing.

It should interest those in the business contemplating the installation of continuous mixers to learn that a continuous mixer of very similar design to those of today was offered the trade in 1906. During that year, the Thomas Block and System of Insulation, developed by the president of the Nebraska State Normal School at Kearney, Nebr., was announced. The system of units, designed to provide continuous air space in walls, is shown herewith. Curing was accomplished by throwing loose sand



Concrete block ties for Pere Marquette Railroad for track construction in city streets. Great Britain used a large number of concrete ties during the recent war

over the units when they were one day old. Roller carriers for gravity handling units from machines were announced by the Matthews Gravity Carrier Co.

The Pegram system for building concrete masonry walls, announced in 1906, is illustrated herewith for it is our understanding that units similar in design to these are now being considered. A single piece block is divided diagonally across the corners as well as the core openings to form a 2-piece wall of right angle triangle block with continuous air space. It was claimed that furring would be unnecessary. These units were made on "Reed" machines, two at a time, of a wet mixture.

In 1907 tests of concrete units were conducted at Purdue university. The block under test were described as the "usual" 16-x 8-x 6-in. size, with two 4-x 5-in. hollow spaces, weight 55 lbs., suggesting that a rapid change to smaller units had taken place. We might add here that lightweight aggregates were not to make their appearance until ten or twelve years later. Wide use of crushed stone aggregates, as well as sand and gravel, was popular.

Concrete tile for floors, roofing tile began to displace slate and clay tile and concrete posts came into wide use on the farms about 1907. Block machinery came under fire and many on the market were criticized for their flimsiness and failure to last under the heavy tamping blows.

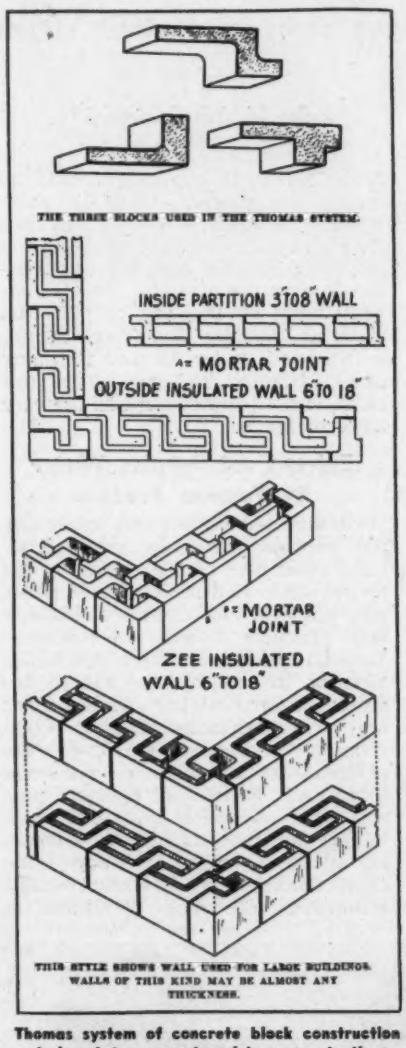
First Exhibit in 1907

The year 1907 saw the first national exhibition of cement products at the Coliseum in Chicago. These shows were to become an annual event under the auspices of the Cement Products Exhibition Co., which was incorporated under the Illinois laws to hold annual expositions of cement products. These exhibitions were promoted by portland cement manufacturers and were supported by ROCK PRODUCTS, CEMENT and ENGINEERING NEWS, CEMENT WORLD, CONSTRUCTION NEWS and other interested publications. It is of interest that in those years special reduced rates were offered by railroads for those attending various national meetings. The first Coliseum show attracted 100,000 people in five days.

The first specifications, in an effort toward standardization, were submitted before the National Association of Cement Users' 1908 convention. New machines kept coming on the market, some for making units of a wet mix intended for denser concrete units. Sears, Roebuck and Co., big Chicago mail order house, advertised a machine for the manufacture of 8-x 8-x 16-in. units for $16.95 including pallets and, along with the machine, went a booklet telling how to make concrete units. A power tamping machine with capacity of 20,000 brick in 10 hr. was offered and chimney molds were advertised. The industry was encouraged to make more specials which offered a great margin of profit. The Universal Portland Cement Co. conducted a $300 prize competition for plans and specifications for concrete houses.

Decorative Facings

In 1910, heavy slag aggregates were coming into use and various facings for concrete block such as white sand, marble and granite chips were coming into use in an attempt to beautify concrete masonry construction. Curing studies were reported on at the meetings and, among a great number of new machines, the Fisher hydraulic block machine was announced. The Western Shaw Block Co. had developed a machine to make 1000 24-x 12-x 9-in. block in 10 hr. under 20 tons pressure. This machine was described as almost automatic. Great interest was being shown in a wide variety of ornamental ware, and various aggregates and a wide variety of waterproofing compounds were being pushed.



Thomas system of concrete block construction designed to prevent moisture penetration

In 1911, the manufacture of concrete posts by a "shaking method" was described. The Zagelmeyer Cast Stone Block Machinery Co. started pushing its system of manufacture by using "slush" concrete poured into molds, 15 to a car. By this time 372 drain tile factories had been established. From its beginning in 1905 in Iowa, the industry had grown to a volume of $5,300,000 in 1911. At this time prices for materials were reported as $2.30 per bbl. of cement, $1.10 per cu. yd. of sand and $1.20 per cu. yd. of gravel. Day labor averaged $2.25 per 8-hr. day.

Much of the concrete block thus far manufactured had been of the rock face variety. In 1912 interest was developing in ashlar stone face block in an effort to break up monotony for construction that required architectural effects. A machine was placed on the market to make such units in 4, 8 and 12-in. heights. Some churches in California were built of such coursed ashlar pattern. The Hobbs Concrete Machinery Co. which built this machine was now advertising a machine capable of an almost unlimited range of sizes. Besser was advertising brick and block machines to the trade in these early years.

Interest in concrete specialties continued during the next few years. Granite-faced press brick, burial vaults, concrete silos and ornamental concrete in infinite variety were actively being pushed. Much wet consistency concrete was being advocated in a controversy over compressive strengths that continued. National Staple Post Co., Westerville, Ohio, started to push its nailable concrete fence posts and sizable orders were being secured for precast stave silos and sectional culverts of various design. An article described concrete fences erected at the Carnegie Steel Co., Bessemer, Penn., which should be of interest. The fence consisted of reinforced concrete panels of 8-and 4-in. thickness set between posts 8 ft. apart. They were made of 1:2:5 concrete and cost $1.80 per lineal foot which competed favorably with other competitive fencing.

Not only was the silo business booming in 1916 but there was a drain tile boom. The farmer business was good. Walter Concretile were gaining acceptance. Among the various facings being used was one of particular interest, consisting of an asbestos serpentine rock fiber for both faces of a unit. It was said that the use of such units in a large cold storage building saved $50,000 in cork insulation. A plant was set up in Chicago employing 78 men for the making of a variety of ornamental

(Continued on page 172)

New Process

VACUUM CONCRETE and Vacuum Lifts

Employed in manufacture of reinforced concrete pipe, bridge slabs and other structural units

By M. W. LOVING*

WITH the exception of vibration, there have been no important developments in the manufacture of reinforced concrete pipe, by the cast process, since 1905, 41 years, when it was first introduced in the United States and Canada. Reinforced concrete pipe was first developed in France between 1894 and 1900.

Reinforced concrete pipe has been manufactured by the machine-tamped and packerhead processes here for more than 20 years and by the centrifugal process for a like period. But generally speaking, the cast process has been confined, in recent years, to reinforced concrete pipe in diameters from 36 to 108 in. and in some cases up to 152 in. With vibration it has been practicable since 1926 to place concrete, with low slumps, in steel molds and obtain high initial strengths, with fairly smooth inner and outer surfaces. With rotating steel drill rods, air bubbles and water pockets have been minimized by some manufacturers.

Reinforced concrete piles, caissons, cribbing units, lighting standards, telephone and telegraph poles and other structural units have been made commercially with concrete of plastic consistencies. The practical reasons why the machine and centrifugal processes have been used to such a great extent in recent years is the great initial investment in steel molds, cast iron or steel base and top rings required to manufacture reinforced concrete pipe and other structural units by the cast or vibrocast methods. Besides, the forms cannot be stripped under 12 and in many cases, 24 hours. This means the unit cost has been high except in the very large diameters.

*Consulting Engineer and Concrete Technologist, Chicago, Illinois.

Extract All Surplus Water By Vacuum Process

Vacuum concrete, and especially the vacuum lifts, has changed all this. From here on out engineers will be provided with reinforced concrete pipe made in any diameter or shape and practical lengths he requires. Vacuum concrete has very high initial strength in compression, a high degree of impermeability and the inner and outer surfaces of pipe, when vacuum concrete is employed, are perfect—like the finish on your living room wall. Reinforced concrete pipe and other structural units are made to very accurate dimensions, depending of course, on the accuracy of the forms employed. Steel reinforcement assemblies are not disturbed in vacuum concrete because they are not subject to forces that may cause displacement as in other methods and processes. Precisely the proper quantity of mixing water is left in the concrete—about four gallons per sack of cement—to assure proper hydration of the cement. Moreover, the extracted water is crystal-clear with no cement or laitance to blemish the surface of the concrete unit or structural member.

But the outstanding advantages are the low initial investment in forms to produce reinforced concrete pipe in any diameter, 36 in. or more, and in lengths of 6, 8, 12 ft., and more limited only by handling and installation facilities.

Simple Forms Speed Stripping

Only two inner and outer steel forms are required because they can be stripped in 30 min. when vacuum concrete is employed with high-early cement. Base rings cost very little because they can and should be made with concrete. Metal top rings, for forming joints, will be made in three sections, 120 deg., because they can be released and lifted from the finished pipe without scoring the inner surface of the joint.

Because forms, base and top rings, are not subject to stresses and with no wear and tear when vacuum concrete is placed in them, maintenance costs are held to a low minimum. Like the top rings, the inner forms will be made in three sections, each 120 deg.—the outer forms in two sections of 180 deg. each.

With vacuum concrete, odd shapes of reinforced concrete pipe can be made to meet the competition of "squashed" stove-iron (corrugated metal pipe). In recent years, some engineers have been persuaded to specify corrugated metal pipe culverts and other hydraulic structures of odd shapes and dimensions. This is especially true when headroom is limited and the engineer wants a large water area, at a lower elevation, than can be provided with circular conduits, in single or multiple lines. The corrugated metal manufacturers only have to deform metal sheets of light gauge, to produce these special conduits. Up to now, they have had



Here are the men who manufacture vacuum reinforced concrete pipe and bridge slabs. Left to right: W. J. Boden, general superintendent; F. J. Colosey, vice-president; and R. P. Petersen, president, Concrete Products Co. of America, Philadelphia and Pittsburgh, Penn. This picture was taken at their Pottstown plant, April 26, 1946

the field to themselves because of the high cost of monolithic concrete structures of like design. But with vacuum concrete these "basket-handle" sections can and will be designed to function as simple arches, lightly reinforced with steel and they will have great structural strength because all of the concrete in the section will be subject to compressive stresses only. However, in yielding foundation conditions, it may be desirable to use steel reinforcement assemblies, but with this exception, the reinforcement will be used to avoid injury during handling. The corrugated metal special sections, on the other hand, have no inherent structural strength and depend for stability on the soil mass through which they are constructed. Moreover, they are expendable and cannot be compared, from the standpoint of life expectancy, with reinforced concrete structures.

Make Bridge Slabs with Prestressed Reinforcing

Vacuum concrete bridge slabs, with bonded steel reinforcement assemblies, opens up a new field for those interested in the manufacture of reinforced concrete structural units. Vacuum concrete with prestressed steel reinforcement assemblies, employing oil-tempered spring steel wire, affords unlimited possibilities. In practically all states of the country there are numerous small bridges that must be rebuilt. In Louisiana alone, according to the Chief Engineer and the Bridge Engineer, of the State Highway Department whom I interviewed in Baton Rouge, May 8, 1946, there are between 3500 and 5,000 wooden bridges that must be replaced in the near future. The price of wood is now sky-high, if you can get it, and with the building boom ahead for the next decade, vacuum concrete prestressed and otherwise has an unlimited future.



Workmen adjusting top ring, made in two parts, on the form for a 72-in. reinforced concrete pipe. Hoses, connected to the vertical manifolds, are shown at the bottom of the forms



Exactly 40 min. after the concrete had been placed in the mold and vibrated, the inner casing was removed. The 10 min. delay was caused by the confusion of the many spectators present at this demonstration. Mold was ready for removal within 30 min. after concrete was vacuum processed

On April 25, and 26, 1946, I visited K. P. Billner, president, Vacuum Concrete Corporation, Philadelphia, Penn., together with R. P. Petersen and Frank J. Colosey, president and vice-president, respectively, of the Concrete Products Company of America, of Philadelphia and Pittsburgh. The latter are experienced general contractors and have been engaged in the manufacture of concrete pipe, reinforced concrete pipe, reinforced concrete cribbing units, etc., for more than 25 years. The company has plants at Pottstown and Pittsburgh, Penn. About a year ago, Mr. Billner approached Messrs. Petersen and Colosey on the proposition of manufacturing reinforced concrete bridge slabs, designed to meet the loading requirements of the Pennsylvania State Highway Department where many bridges must be constructed in the postwar period. When these gentlemen showed me the pictures, shown on pages 170-172, in Chicago, April 11, 1946, and told me about what they are doing with vacuum concrete, I was amazed, and as a consequence, went to Philadelphia at the first opportunity. To appreciate the magniture of this proposition it is only necessary for the reader to review the article entitled "Precast Structural Members Facilitate Speedy Erection of Rigid-Frame Buildings" by W. Mack Angas, Commodore (CEC) USN, Bureau of Yards and Docks, U. S. Navy, in *Engineering News-Record*, April 18, 1946, page 88.



Inner surfaces of the molds are faced with this canvas lining which functions as a filter, thus the excess water in the concrete when vacuum processed is crystal clear. After each operation the canvas is washed down with a hose, as shown in this picture



Closeup of hose connections to vertical manifolds which extend the full length of the mold. Twelve manifolds were used on the outer mold and 12 on the inner mold. One-quarter inch holes are drilled through the molds under the manifolds, so that the water can be extracted from the concrete when vacuum processed

Prestressed Concrete "Stunts"

Special attention is called to what Commodore Angas says about vacuum lifts employed in the handling of large reinforced concrete slabs and structural members. In Philadelphia,



Closeup of inner surface of the 72-in. reinforced concrete pipe after inner core was removed



Manufacture of a 5-ton bridge slab, overall length 32 ft., width at top 3 ft., for a clear span of 30 ft. Aluminum side forms fitted with manifold which extends its full length. The side forms are held in place by vacuum and are easily kicked off when suction is released



Illustrating advantages of the vacuum lift which operates under suction ranging from 1000 to 1200 lb. per sq. ft. Aluminum side forms are shown at the right and aluminum bulkheads at the left. The smooth concrete form is shown directly under the bridge slab

April 25, Mr. Billner showed us two stunts that to me at least were astounding. He has a rubber inner tube of a foot ball partly filled with sand. When vacuumed, this loose sand within the rubber tube, becomes hard as a rock and Mr. Billner beat on it with a hammer in my presence. This stunt, as he terms it, is a prestressed basis of vacuum concrete. The other stunt, as he terms it ,is a prestressed concrete rod, 16 ft. in length, and only 2 in. square. It is reinforced with four ⅛ in. oil-tempered spring steel wires in each corner, with a cover of only ¼ in. and prestressed to 100,000 p.s.i. The 16-ft. rod is mounted vertically, the lower end rests in a floor socket and the top is held in another socket in the ceiling of the room. Mr. Billner pulls and pushes the *flexible rod* back and forth in 16 in. cycles, 8 in. each side of center-line. The vacuum concrete, which is held in compression only, has no hair cracks of any kind, after years of this kind of demonstration.†

In correspondence with Mr. Billner in 1945, he gave me the following facts on vacuum concrete and his method of prestressing it with steel reinforcement assemblies:

Vacuum Concrete Results

This method is an extension of the Cement-Water ratio law, which states that the strength of concrete is in inverse ratio to the amount of water used in the mix. The concrete is mixed with sufficient water to produce a plastic mix, so that when placed it will fill the forms properly. The excess water, not needed for the hydration of the cement, is then squeezed out by atmospheric pressure and removed by suction. The concrete then hardens and the following benefits accrue:

3-day strength is increased by 100%; 5-day strength is as high as the 28 day strength of the same concrete, not vacuum-processed; 28-day strength is increased by the average of 50%; 1 year strength is increased by the average of 30%.

Shrinkage is reduced in proportion to the elimination of "free water."

Resistance to freezing and thawing is increased *several times.*

This process is entirely physical. It therefore makes no difference if standard portland or high-early-strength cement is used.

Electric Prestressing

Plain, round rods or wires are coated with a thermoplastic material which adheres to the steel with the same strength as concrete. These

(Continued on page 172)

†I took pictures of all of this in Philadelphia and others in Pottstown, April 26, but when I got back to Chicago, I discovered the shutter on my camera was on the blink and many of the negatives were blank. Perhaps the strain, caused by the subjects of my pictures taken at the Convention (see ROCK PRODUCTS, May 1946) was too much for my camera!

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coated rods or wires are placed in the forms and concrete is poured around them. The concrete is permitted to harden. Then the rods are heated by sending an electric current through them. This melts the bonding material, the rods become loose and they extend because they are heated. The rods are then anchored at their ends and the electric current is discontinued. The rods then cool, the thermoplastic coating solidifies, and so *the bond is re-established.*

For wires up to ⅛ in. diameter, the surface area is sufficient to develop enough bond so that the anchorages can be removed. For larger diameter rods the anchorages remain permanently. Rods up to 1 in. diameter have been sucessfully prestressed in this manner.

Advantages

With high tensile strength steel prestressing can be carried to 160,000 p.s.i. It is recommended that in practice, prestressing of 120,000 p.s.i. be used. This means that working stresses of 120,000 p.s.i. can be used instead of 18,000 p.s.i. with ordinary reinforced concrete. This leads to a saving of 75% or more of the reinforcing steel.

In ordinary reinforced concrete, horizontal and vertical shear stresses result in diagonal tension, which must be resisted by shear reinforcement. In prestressed concrete, the entire concrete cross-section is in a state of compression. Therefore, there can be no diagonal tension and *therefore, as a rule, no shear reinforcement is required.*

The fact that the concrete is in a state of compression, prevents formation of cracks caused by shrinkage.

W. J. Boden, general superintendent, Concrete Products Co. of America, Pottstown, Penn., has been manufacturing reinforced concrete pipe for more than 26 years by the cast and machine-tamped processes. The expensive and well-equipped plants of the company are located at Pottstown and in Pittsburgh. The pipe manufactured by this company is of first quality and has been tested over the years at frequent intervals. I was anxious to get Bill's slant on this practical application of vacuum concrete in the manufacture of reinforced concrete pipe because they have been in production with it for some time. He was also in charge of the manufacture of bridge slabs, shown in the accompanying pictures. Bill said that as far as he was concerned it was entirely practicable to discard the other processes they have employed over the years and produce vacuum processed reinforced concrete pipe exclusively.



Mr. Billner designed the slab to comply with the loading requirements for built-in-place structures of equivalent length of the Pennsylvania State Highway Department. This illustration shows a concentrated load of 22 tons on a clear span of 30 ft. The total length of slab is 32 ft.

Various tests have been made on 66-in. reinforced concrete culvert pipe on a comparative basis, using standard cast process versus vacuum process on identical specifications, and the general conclusion reached on the comparison of tests indicated that the vacuum process reinforced concrete pipe produced a 50 percent increase in compressive strength in both the 0.01-in. crack and the ultimate load.

Open Branch Plant

Lister Concrete Products Co., Waterloo, Iowa, will open a products plant in Des Moines this Fall to produce precast concrete steps, under a license from the Pre-Cast Step Form Co., St. Paul, Minn.

Fifty Years of Concrete Products

(Continued from page 167)

concrete products and other specialties. It will be of interest to the hundreds of plants now considering bulk cement for the first time to learn that only now are they following recommendations made back about 1915. At that time the cement companies carried full page advertising in the tradepress urging the adoption of bulk cement.

In all the foregoing we have commented on the cycles of growth in the concrete block business. The development of the industry was meteoric particularly in certain periods but by today's standards the industry was small. There were many plants but of small capacity and the total volume of concrete so sold was but a fraction of that moved in recent years. One important reason was that quality was difficult of control with so many uninformed small operators in the business. And, the development of machines to make a unit of high quality was lagging behind market demands for better construction materials. The industry was vulnerable and the period from 1917 on was an important one in which research and product improvement through efforts of organizations like the Portland Cement Association played no small part. The city of Detroit, now considered the leading metropolitan user of concrete masonry for high-type construction, took steps back in 1917 to eliminate inferior concrete block. Plants were put under a licensing system and in order to secure a license units were subjected to rigid test. Brand or trademarks were required to be filed with building authorities so that a check could be made that only licensed units were being used throughout the city.

At the time of World War I, 1918, the Kent continuous mixer with automatic measuring to eliminate hand labor was being actively merchandised. This mixer was available in stationary and portable models and employed a pug-mill mixing principle.

Promoted Farm Market

Just as in World War II, the farm market sprung into prominence. Concrete silos, milk houses, hog troughs, fence and corner posts, ice houses, manure pits were actively being merchandised to the farmers. It was in 1918 that the Portland Cement Association organized a Farm and Cement Products Bureau with A. J. R. Curtis as manager. Function of the Bureau was to aid the concrete products man in his manufacturing and merchandising problems.

Along about that time, Duff Abrams' water-cement ratio theory was being publicized which as we all know, became established for concrete work of all types. Then, concrete block machinery came under scrutiny in earnest for the various mechanical devices in use on the machines were limited mechanically to either a too wet or a too dry mix. Sticking and slumping were problems that had to be licked and the industry was in need of more-nearly automatic machinery to reduce hand labor. This objective has finally been completely realized through the efforts of machinery manufacturers now in the business.

In 1919, the Goodlet vibrator came on the market. This device, the first recorded in our volumes employing the principle of vibration, consisted of reciprocal movement of a mold-bearing frame supported over a fixed lower frame. The upper frame reciprocated back and forth in a horizontal plane and had a variable stroke and speed. This being a post-war year, the country had its housing shortage, and the requirement was for 500,000 homes annually in the $4000 price range.

An interesting survey was con-

ducted in 1919 that disclosed a market for 480,000,000 fence posts on farms and for 500,000 highway markers. Lawn rollers of precast concrete, precast concrete lumber 3 ft. long, 12 in. wide and 2 in. thick weighing 72 lb. and railroad crossing signs of concrete were among the specialties mentioned in 1919 articles.

Lightweight Aggregates

The year 1920 and those shortly thereafter were important to the concrete block industry for lightweight aggregates came into commercial use to satisfy a growing demand for lightness and the other favorable properties for certain classes of work inherent in lightweight concrete. An accounting of the development of Haydite, manufactured by burning argillaceous materials in kilns, developed by Stephen J. Hayde, Kansas City contractor and manufacturer, was published in 1920.

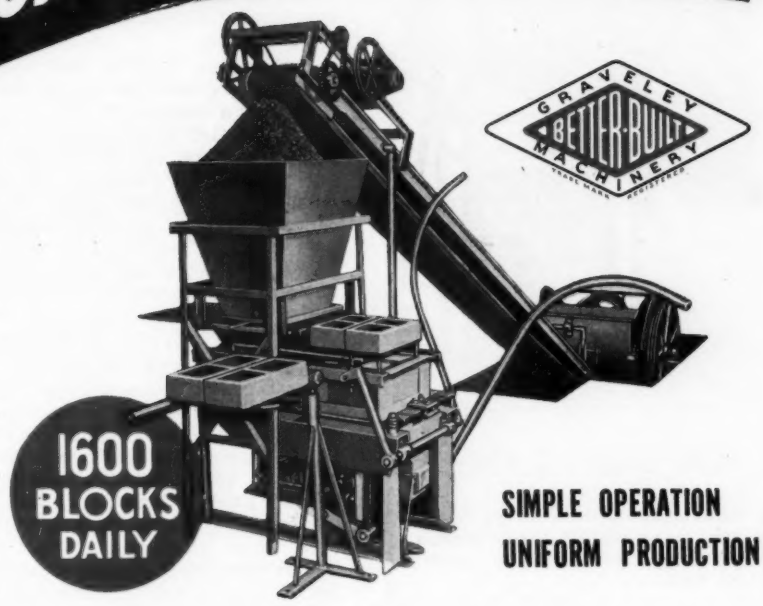
According to an item published that year there were 609 concrete block companies active in 1917 and 920 in 1918. Prices for 8-x 8-x 16-in. units averaged 13.6c in 1917 and 12.7c in 1918 but the range was as high as 35c for some concrete units. Some of the familiar names in the industry today began to appear in print about 1920 such as the Cunard-Lang Concrete Co., Columbus, Ohio; Fellabaum Bros., Toledo, Ohio; Badger Concrete Products Co., Oshkosh, Wis.; Concrete Products Corp., South Bend, Ind. There was a surge of new plants but, in 1921, a shortage of cement closed some plants.

During 1921 and in issues over the next few years much was written of Francis J. Straub, New Kensington, Penn., a familiar figure at the N. C. M. A. national conventions today. Mr. Straub, as most of us know, invented the cinder block and was issued patents covering the manufacture of units entirely made from processed cinder aggregates. The first Straub cinder block house was built in 1913 and some 2000 buildings of cinder block were built over the next 8 years. The patent was issued in 1917 and 22 plants were licensed to manufacture Straub cinder block by 1921, when Mr. Straub made his appearance before the Chicago City Council in an effort to have cinder block adopted. Architects liked the product and were in favor of its acceptance. The Studebaker Corp., South Bend, Ind., used cinder block in the construction of employe's homes in one of the first important projects.

Shortly thereafter Mr. Straub conducted fire tests to prove the soundness of his product. Soon fire test demonstrations were being conducted by various groups to develop data of value in the promotion of concrete masonry generally. Early uses of cinder block were principally for backup for brick, stucco base and of 4-in. thickness for partitions.

Other lightweight aggregates were

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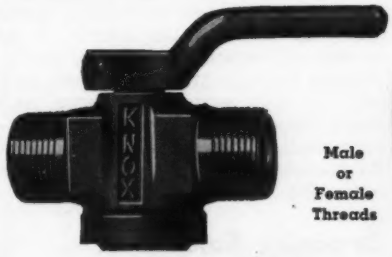
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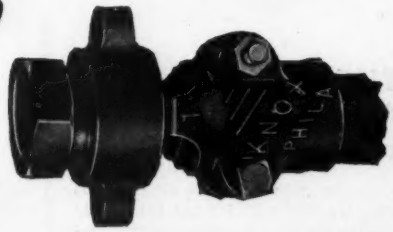
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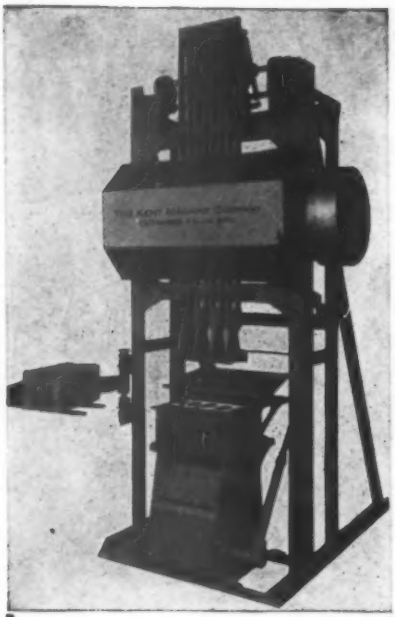
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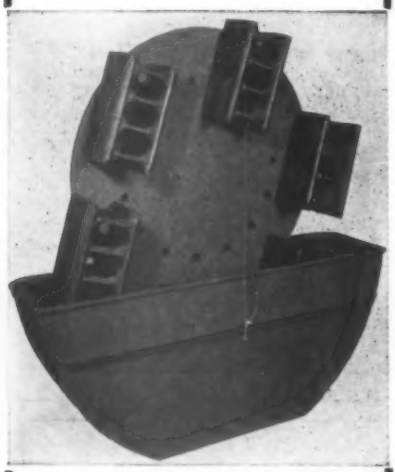
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being developed soon thereafter including that originated by Porete Manufacturing Co., Newark, N. J., for the manufacture of lightweight roof slabs that weighed 55 lb. per cu. ft. More recently, of course, the industry has had available the expanded basic slags such as Waylite, Superock and Celocrete, pumice and has developed products of vermiculite concrete, etc.

Codes and quality occupied the attention of the industry from this time over a number of years. A 1923 study revealed that Detroit was consuming 15 bbl. of cement per year per capita while Chicago utilized less than ½ of 1 bbl. per capita. Chicago codes restricting concrete masonry's uses were a factor. The need for educational work and promotion was obvious and efforts were being directed in that direction.

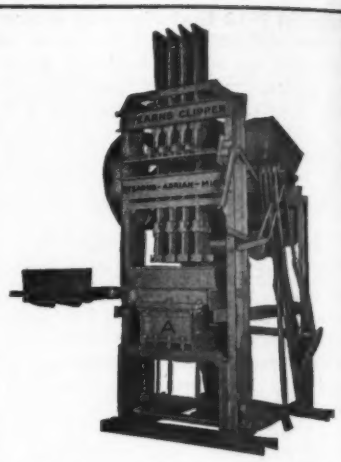
In one of our 1923 issues a list of miscellaneous and special uses for precast concrete was published that should challenge the imagination. Among them were concrete block, fences and other farm specialties, silos, tile, pipe, posts, culverts, ornamental lighting standards, markers, trolley poles, insulation applications, bath tubs, bird baths, sun dials, flower boxes, culverts, cribbing, sills, lintels, cornice block, columns, porch rail, railroad signals, urns, benches, vases, fountains, statuary, pedestals, vaults, roofing tile, railroad ties, garbage boxes, laundry tubs, meter boxes, etc. These products and others had been made prior to 1923 and if supplemented by some of more recent date which most of us know of would be an imposing list.

The foregoing has been but a sketchy reporting of events in the early development of the industry. Much had to be and was accomplished through research and promotion and in the development of machinery in the years following up to our modern times, but the important revolutionary developments to come, such as vibratory block machines of high capacity with automatic features, power lift trucks, offbearers, modern mixers and handling equipment, high pressure steam curing, etc., are of such recent date they are familiar to most of us.

In conclusion, we emphasize again that our presentation herein is by no means comprehensive. Our observations have been largely from records in our own publications and many important individuals and organizations obviously have not been mentioned. Such a treatise as this otherwise could go on indefinitely.

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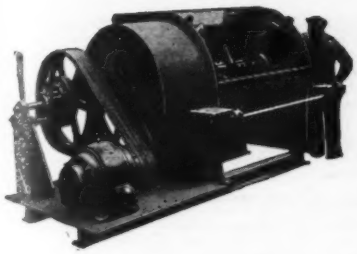
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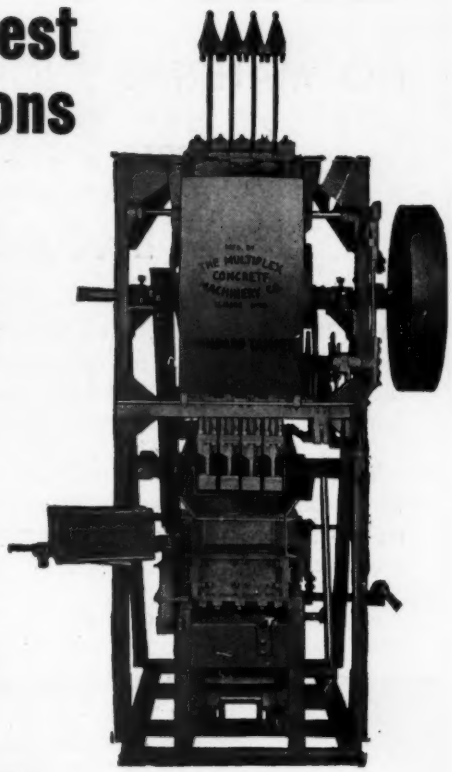
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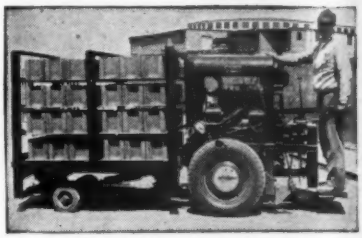
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....Bagging Machines
....Bags
....Barges
....Batchers
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....Belt Repair Equipment
....Bin Level Indicators
....Bins and Batching Equipment
....Blasting Supplies
....Block Machines, Concrete Building
....Bodies, Trailer
....Brick Machines and Molds
....Buckets
....Bulldozers
....Cars, Industrial
....Classifiers
....Clutches
....Coal Pulverizing Equipment
....Concentrating Tables
....Concrete Mixers
....Concrete Mixing Plants
....Concrete Specialty Molds
....Concrete Waterproofing and Dampproofing
....Conveyors
....Coolers
....Cranes
....Crushers
....Derricks
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....Diesel Engines
....Dragline Cableway Excavators
....Draglines
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....Drilling Accessories
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....Mills
....Pulverisers
....Pumps
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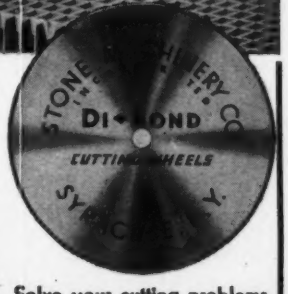
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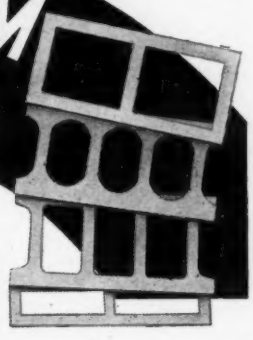
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ALUMINUM PALLETS



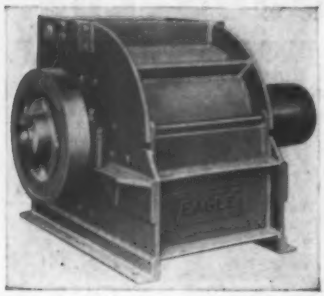
8 REASONS WHY ALUMINUM PALLETS SPEED PRODUCTION

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4. SKF double-roller, self-aligning bearings completely protected from dust by labyrinth seals.



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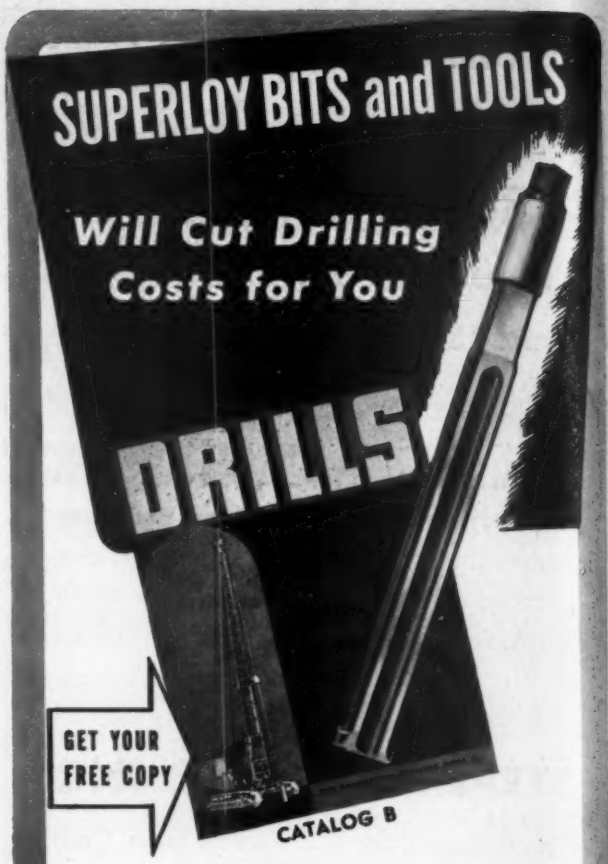
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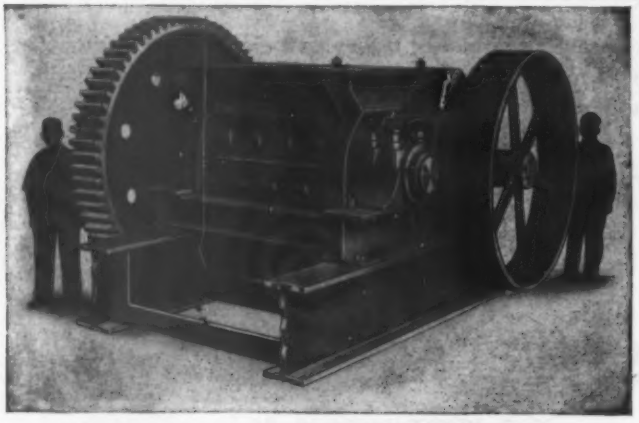
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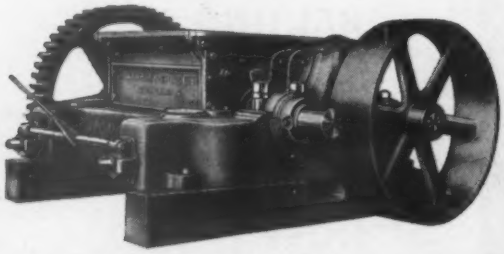
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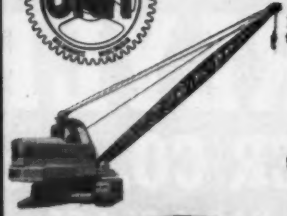
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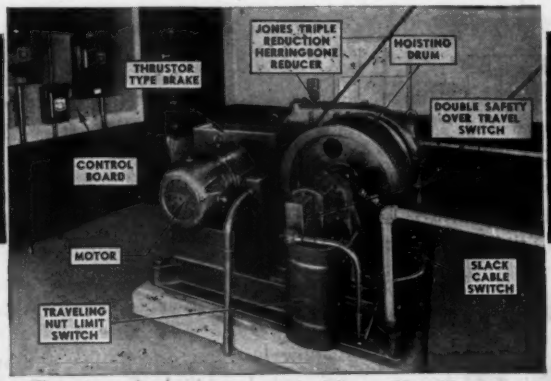
LIMA LOCOMOTIVE WORKS, INCORPORATED
SHOVEL AND CRANE DIVISION — LIMA, OHIO

For Economical Material Handling
JONES SKIP HOIST DRIVES

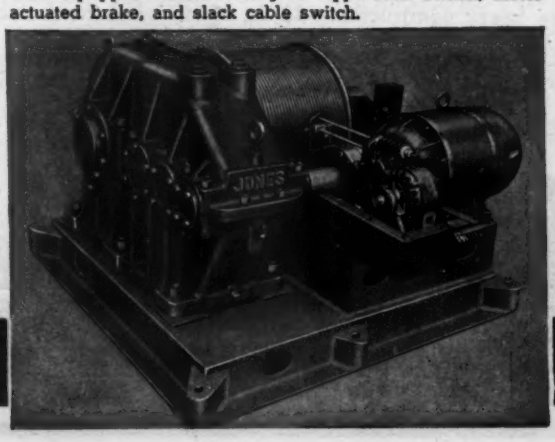
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• The view above shows a typical Jones Skip Hoist Drive installation while the view below shows one of the Jones units equipped with traveling nut type limit switch, motor actuated brake, and slack cable switch.



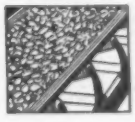
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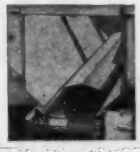
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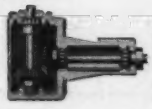
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View of our heavy cut steel and bronze, 15 to 1, Gear Reduction. Simple, efficient, trouble-free. Will give years of service.



View of our Distributor Case. Heavy, hardened and annealed cut steel gears.



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The "Slugger" is built in Seven Sizes — from 30 to 150 horsepower — write for illustrated bulletins today.

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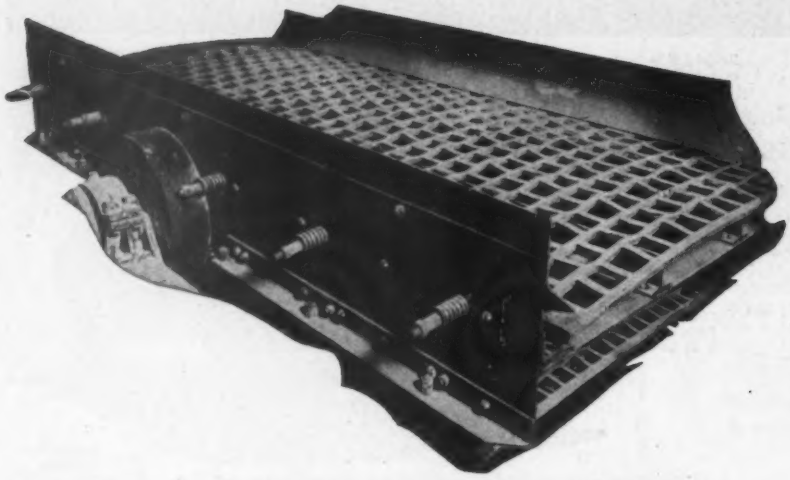
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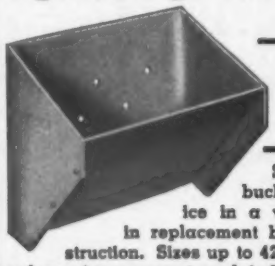
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WRITE TODAY FOR BULLETIN F-100 that shows how easy it is to repair rips, to strengthen soft spots and to put in patches by using Flexco HD rip plates. The bulletin also shows how to make tight butt joints in both conveyor and elevator belts with Flexco HD Belt Fasteners. These fasteners are made in six sizes. Furnished in special analysis steel for general use and in various alloys to meet special conditions.

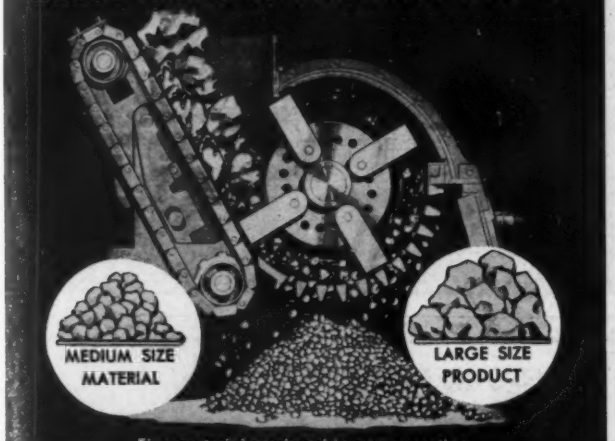

Flexco HD Rip Plate


Flexco HD Belt Fastener

FLEXIBLE STEEL LACING CO.
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FLEXCO HD BELT FASTENERS
Sold by supply houses everywhere

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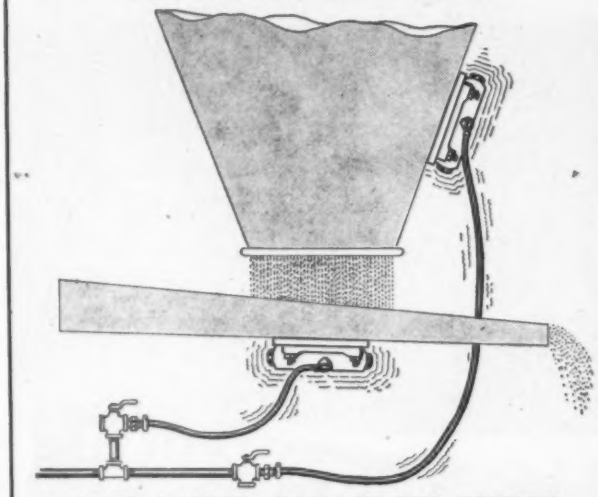
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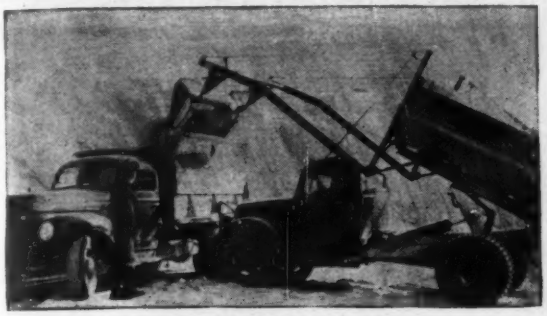
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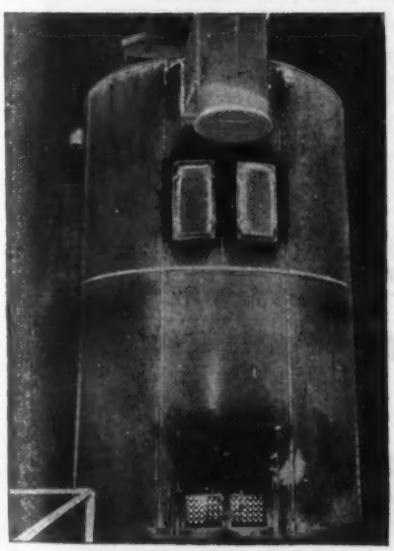
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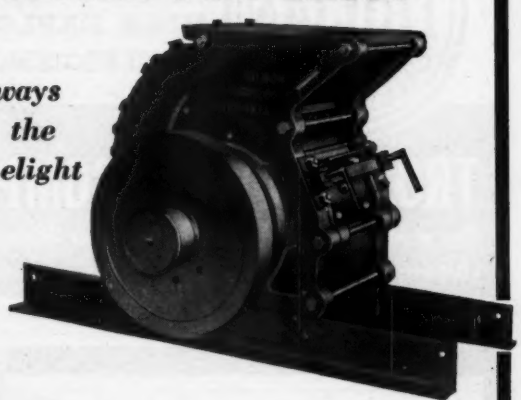
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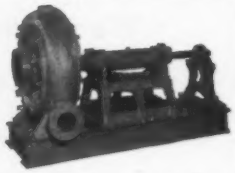
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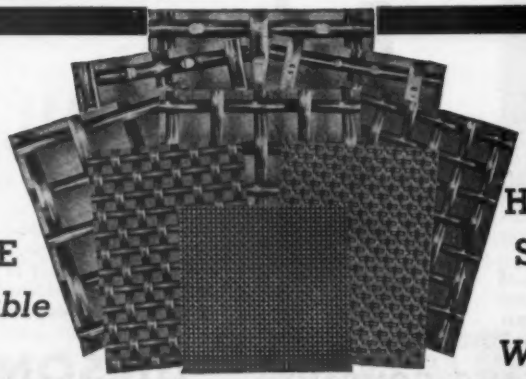
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30x24 Jeffrey Type Swing Hammer Pulverizer
Dings Magnetic Separator 1R14, 110 Volt, 86 RPM, complete with M-G set
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42"	5	1/8"	1/16"	20"	4	1/8"	1/32"
36"	6	1/8"	1/16"	18"	4	1/8"	1/32"
30"	6	1/8"	1/16"	16"	4	1/8"	1/32"
30"	5	1/8"	1/16"	14"	4	1/16"	1/32"
24"	5	1/8"	1/32"	12"	4	1/16"	1/32"
24"	4	1/8"	1/32"				

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14"	6	8"	6	4"	5
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12"	5	6"	6	3"	4

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	25 "	7.50
	35 "	10.50
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1½"	50 "	15.00
	25 "	10.00
	35 "	14.00
	50 "	20.00

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	50 "	10.00	1.50 "
¾"	25 "	6.25	2.50 "
	50 "	12.50	2.50 "
1"	25 "	10.00	3.50 "
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48" x 36" Gruendler Single Roll Crusher
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2 yard Manganese Shovel Bucket
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Any size Belt or Chain Elevator, with Gear or Speed Reducer
20 Brand new American Pulley Speed Reducers, 13 to 1 reduction
4000' Brand new Conveyor Belting, from 18" to 36" wide
76 Pillow Block Link Belt Roller Bearings for 2 11/16 Shaft & 1 15/16 Shaft
180 Self-Aligning Stephens-Adamson Ball Bearing Pillow Block for 2 3/16, 2 7/16, 3 7/16 and 4 15/16 Shafts
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1—62½ ton Insley Stiff Leg Derrick, 54' mast, 70' boom.
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DERRICKS IN EXCELLENT CONDITION LIKE NEW

AIR COMPRESSORS

Portable and stationary, belt with elec. or gas power, sizes from 20 cu. ft. 1,000 cu. ft.

CRUSHERS

1—Acme Style D #9½ Jaw Crusher, with screen, elevator and gas eng., 12 to 18 tons per hour.
1—9½x24" United Iron Works Jaw Crusher.
1—12x20" Acme Road Machinery's Jaw Crusher, Ser. No. 1873, Style A.
1—9x16" Climax Jaw Crusher #2.
1—9x16" Acme Jaw Crusher #1686, size 8½A.
1—9x18" Sawyer Massey Jaw Crusher.
1—#5 Allis Chalmers Gyratory Crusher, #5331, size 10x38".
1—#5 Austin Gyratory Crusher, Ser. No. 2945, size 12x35½".

DERRICKS

4—Steel guy derricks. 2—20 ton American steel guy derricks, 110' masts, 90-100' booms. 1—15 ton American steel derrick, 83' mast, 75' boom. 1—5 ton Terry Guy Derrick, 70' mast, 60' boom.
11—Stiff leg derricks. 1—25 ton Wiley, 30' mast, 60' boom. 1—15 ton Clyde, 30' mast, 45' boom. 1—11 ton Fort Pitt, 38' mast, 70' boom. 8—4 ton Ingrams, 50' booms, brand new.

HOISTS (Electric, Gas, Steam)

85—Electric, ranging from 30 H.P. up to 125 H.P. consisting of triple-drum, double-drum and single drum, with AC or DC motors, some with attached swingers. Following makes: American, Clyde, Lambert, Lidgerwood and National.
Gas hoists ranging from 8 to 120 H.P., single, double and triple-drum all standard makes (38 in stock).
Steam, ranging from 8 H.P. to 60 H.P., single, double and triple-drum; all standard makes.

PNEUMATIC TOOLS
Column Drifters and Tripods

4—Model 17 Denver rock drills.
3—Sullivan high-speed drills, Model FG-3.
5—Ingersoll Rand type X71 drifters.
4—Gardner Denver drills with drifter mountings.

JACKHAMMERS

8—Jackhammers, consisting of Hardsoco, Worthington and Cleveland. 45 lb. and 85 lb. class.
4—Ingersoll Rand Model BCR-430 jackhammers, 47½ lb.
1—No. 3 Hardsoco 50 lb.

WAGON DRILLS

2—Gardner Denver derrick drills with Model 21 Gardner Denver drill; will drill 30 ft.
1—Ingersoll Rand drill, size D, with utility air hoist and Ingersoll Rand X71 drill.
1—Ingersoll Rand Model FM-2 drill, with Ingersoll Rand air hoist, size X71 drill, mounted on pneumatic tires; will handle 20 ft. steels.
2—Ingersoll Rand, Model FM-2, with air hoist and IX71 drill, mounted on 3 steel wheels; will handle 20 ft. steels.
1—Ingersoll Rand drill No. 3122, with X71 drill, mounted on 4-wheel trucks; will drill up to 36 ft. deep holes.

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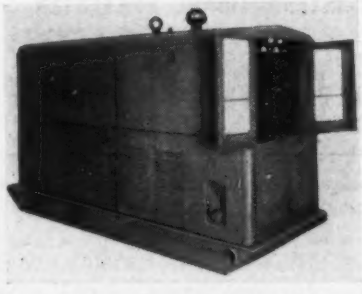
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60 cycle 127/220 volts
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56-S MIXER, for central mix plant. "Ransome" with 40 h.p. 440 V. 3 phase motor.
SAND PUMP, "Erie" 8", on skids with pulley, no power.
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30 Ton 1942 Model 30S Orton Steam Locomotive Cranes, 100' boom.
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1—170 cu. yd. capacity, water level, all steel, Bin, 20 x 20', single compartment with V bottom, 13'6" clearance from bottom of bin to base of column.

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BLOWER: Ingersoll Rand 100 H.P., electric, 12000 CFM @ 1.7 lbs. pressure. NEW CONDITION.

BOILER: Erie City 150 H.P., self-contained, Economic type, ASME code, 150 lbs. pressure, complete with all fittings.

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COMPRESSOR: Sullivan, two stage, angle compound, 975 ft. capacity, with 185 H.P. synchronous motor, 2200 volt, complete and guaranteed.
2—Model XCB, 1055 C.F.M., 440 volt, induction motor, short belt drive. NEW.

HOIST: Clyde 80 H.P., electric with 15 H.P. separate swinger.

DRAG SCRAPER: Sauerman 1 yd. capacity with Crescent drag scraper bucket, 60 H.P. gasoline powered, 2 speed, Hoist, all cables, blocks, etc.

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Also, sizes 12 x 24 to 48 x 60.

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1—10' x 90' Cooler or Dryer.
Also, several other sizes.

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MINE HOISTS: 1—150 H.P., drum 72 x 72". 1—450 H.P., drum, 10' dia., 7' face. 1—600 H.P., 96" dia., 116" face. 1—120" dia. x 120" face, with 500 H.P. motor. All 3 phase, 60 cycle, 2200 volt.

LOCOMOTIVE, STEAM: 1—Lima 80 ton, 6 wheel, Switcher with tender, thoroughly modern, excellent condition. Sale or rent.

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SCREENS: Robins Vibrex, double deck, 48" x 120", speed 1800 RPM, purchased new 1942, never used, new condition. Also, Robins, Link Belt, Simplicity, Nordberg, Telsmith, Traylor; all sizes.

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1—9 x 36 Cedar Rapids Jaw Crusher.
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1—100 H.P. 1800 RPM electric motor.
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Several 40 and 50 H.P. electric motors at various speeds.
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Merrick Weightometer for 30" Belt or less
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Open & Closed 18" Spaced Bucket Elevators
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60' Continuous Elevator, 50' centers.
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Perfect running order
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All complete with pulleys

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46—KOPPEL, 1½ Yd. 24 & 30 In. Ga., V Shaped.
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30—8000 gal. cap. tank cars.
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Gas: 15, 30, 60, 100 & 120 HP.
Electric: 30, 52, 80, 100 & 150 HP.
Steam: 6¼x8, 7x10, 8¼x10, 10x12, 12x24.

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75, 90, 180, 200 HP. F. M. Engines.
175 KVA Worthington 3/60/2300.
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5'x22" HARDINGE CON. Dry Ball Mill.
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10,000 Gal., 15,000 Gal. & 20,000 Gal. Cap.

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5 No. 19, 25, 37 & 49 Kennedy.
18 in., 24 in., 30 in., 36 in & 48 in. Symons Disc.
4—10 TZ Traylor 4 ft. Gyratory.
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Head & Tail—Pulleys—Takeup for all sizes.
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36 In.x20 Ft., 3 Ft.x30 Ft., 4 Ft.x30 Ft., 54 In. x30 Ft., 42 In.x24 Ft., 5 Ft.x30 Ft., 5 Ft.x16 Ft., 5 Ft.x60 Ft., 6 Ft.x60 Ft., 6 Ft.x20 Ft., 6 Ft.x70 Ft., 10x20, 7½x100 & 8x 110 Ft. Kilns.

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GUY: 8 ton 85 Ft. Boom, 15 Ton 100 Ft. Boom, 20 Ton 115 Ft. Boom, 50 Ton 100 Ft. Boom.
STIFF LEG: 5 Ton 70 Ft. Boom, 15 Ton 100 Ft. Boom, 25 Ton 100 Ft. Boom, 75 Ton 135 Ft. Boom.

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GASOLINE: 3 Ton, 5 Ton, 8 Ton, 12, 14, and 30 Ton.
STEAM: 9 Ton, 20 Ton, 40 Ton, 60 Ton & 80 Ton.
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HUMMER ROTEX, NIAGARA & ROBINS.
REVOLVING: 3x12, 3x16, 3½x18, 3x24, 4x16, 4x20, 4x23, 4x24, 5x30, 5x20, 6x20.

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REDUC. TYPE: Kennedy Nos. 25, 37 & 49. Telsmith 3-F & 46. Traylor 36" TZ, 8", 10", 12". Super. McCully 6"x10". Newhouse 5, 7, & 10". Symons Cone & Disc 7', 5' to 4'.
ROLLS: Allis-C. 13½x12, 36x10, 40x15, 54x24 & 72x30. Fairmount 36x20 & Jeffrey 34x24 to 36x54 single roll. Cornish 36x14 & 42x16, Etc.
HAMMERMILLS: Williams No. 1, 2, 3, 4, 5, & 9. Jeffrey 36x18 & 36x42. Day Nos. 20 & 40. Etc.
MILLS: Kennedy Ball 4x6, 5x6 & 5x8. Marcy 8x6 & 10x9. Hardinge 6'x3', 8'x30" & 6'x9'. Misc. Tube Mills 5' & 6'x22'. Sturtevant Ring Roll. Raymonds, Kents, Fuller Lehigh, Etc.
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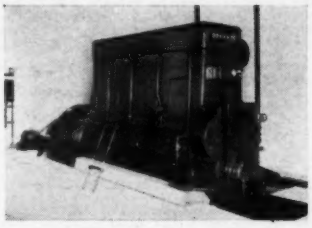
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PLANT MANAGER—Young engineering executive with extensive experience in quarrying, plant design, operation and management, quality control and sales development available for affiliation with any reputable company. First class references. Write Box D-66, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Illinois.

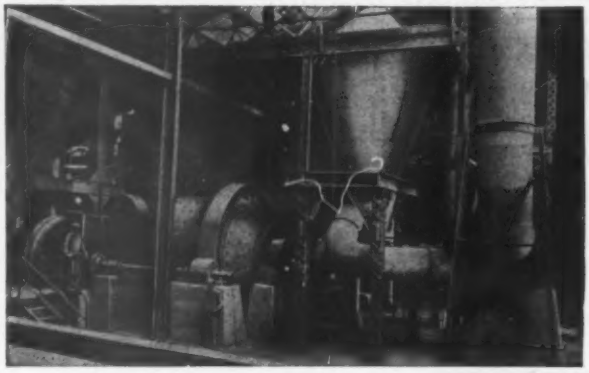
MANAGER OR SUPERINTENDENT for Sand & Gravel Plant. Age 38. Married, 2 children. Desires permanent position. Thirteen years' experience in plant operation. Familiar with dredge or dry excavation and all phases of washing, screening and crushing. Can assume complete responsibility. Prefer Ohio or vicinity but will consider any good opportunity. Write Box D-64, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

CHEMIST—22 years in cement industry. Also research, and experience with limes, ores, metals and soils. Capable of supervision. Wishes to locate in the South. Write Box D-59, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

CEMENT CHEMIST—would like position as chief or ass't chief in progressive organization. 19 years' experience in manufacture and use of cement. For details, write Box D-60, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

FORMER ARMY MAJOR with twenty years' experience as chief chemist and assistant chief chemist in modern cement plant desires a position, preferably the west coast. Am willing to go to Mexico or South America, if inducement is satisfactory. Write Box C-95, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

CHEMICAL ENGINEER: After July 1 with varied experience in cement manufacture, wet and dry. Chief Chemist 3 years, Manufacturing & Concrete Research 8 years, Technical Service 3 years. Write Box D-69, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.



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INDEX TO ADVERTISERS

Aaron Machinery Co., Inc...196
Allis-Chalmers Mfg. Co...14, 15
Amer. Air Filter Co., Inc... 64
Amer. Brake Shoe Co..145, 199
Amer. Cable Div. .....IBC
American Chain & Cable Co., Inc. .....IBC
Amer. Cyanamid Co.— Insert between pages...37, 38
Amer, Cyanamid & Chem. Corp. 139
Amer. Manganese Steel Div. 145
American Pulverizer Co....134
Anchor Concrete Machy. Co. 174
Appley, J. W., & Son, Inc. 175
Armstrong-Bray & Co.....186
Arrow Contractors Equipment Co. 191
Austin-Western Co. 60
Babcock & Wilcox Co..... 68
Barber-Greene Co. 50
Baughman Mfg. Co. 183
Bemis Bro. Bag Co. 21
Besser Mfg. Co. 158, 159
Bethlehem Steel 48
Bird Machine Co. .....IFC
Birmingham Rail & Locomotive Co. 195
Blatt, Frank I., Sales Co., Inc. 160
Blaw-Knox Co. 186
Bonded Scale Co. 190
Boston Woven Hose & Rubber Co. 63
Bradley Pulverizer Co.....141
Brill Equipment Co. 190
Brooks Equip. & Mfg. Co...142
Bucyrus-Erie Co. .....OBC
Buda Company 45
Butler Bin Co. 162
Capital Bank & Trust Co...195
Carlyle Rubber Co., Inc.179, 190
Caterpillar Tractor Co. 23
Chicago Perforating Co. 188
Chicago Pneumatic Tool Co. 128
Chicago Steel Foundry Co...154
C. I. T. Corp. 53
Classified Advertising...189-197
Cleveland Wire Cloth & Mfg. Co. 188
Clinch Mercantile Co. 192
Columbia Const. Co., Inc...196
Combustion Engineering Co., Inc. 30, 31
Davenport Loco. Works....182
Deister Machine Co. 148
De Lavel Steam Turbine Co. 35
Detroit Diesel Engine Div. 52
Dewey & Almy Chemical Co. 143
Diamond Iron Works, Inc.. 22
Dixie Machinery Mfg. Co...185
Dorr Co. 137
DuPont de Nemours, E. I., & Co., Inc. 136
Dyer, W. H., Co. 194
Eagle Crusher Co., Inc.....178
Ehrsam, J. B., & Sons Mfg. Co. 187
Electro-Alloys Div. 199
Elwood Sales & Mfg. Co....193
Ensign-Bickford Co. 43
Equip. Corp. of America....191
Erickson Special Equipment Mfg. Co. 176
Erie Steel Construction Co..154
Euclid Road Machinery Co..131
Farrel-Bacon Co. 148
First Machinery Corp. 196
Flam, Stephen, Inc. 177
Flexible Steel Lacing Co....185
Florida Die Casting Fdry...177
Ford Motor Co. 37
Frog, Switch & Mfg. Co....155
Fuller Co. 28
Gar Wood Industries, Inc... 27
Gardner-Denver Co. 16
Gates Rubber Co. 44
General Electric Co. 40, 41
General Excavator Co. 42
General Motors Corp. 13
General Traders 196
George, F. C., Machine Co..171
Gilson Bros. Co. 187
Gilson Screen Co. 146
Goodall Rubber Co. 182
Goodrich, B. F., Co. 1
Goodyear Tire & Rubber Co. 9
Graveley, Bob 173
Gruendler Crusher & Pulverizer Co. 17, 18, 19, 20
Hammond Bag & Paper Co..153
Hardinge Co., Inc. 198
Harnischfeger Corp. 8
Harrington & King Perf. Co.142
Hayward Co. 186
Heat & Power Co. 189
Heidenreich, Jr., E. Lee....197
Hendrick Mfg. Co. 184
Hendry Corp. 160
Highway Equip. Co., Inc... 59
Industrial Brownhoist Corp.152
Industrial Machinery & Supply Co. 194
International Harvester Co. 33
Iowa Mfg. Co. 24
Iron & Steel Products, Inc..194
Jackson & Church Co.....161
Jaeger Machine Co. 185
Johnson & Hoehler, Inc....197
Jones, W. A., Foundry & Machine Co. 181
Kansas City Hay Press Co..188
Kennedy-Van Saun Mfg. & Eng. Corp. 10, 11
Kent Machine Co. 174
Knox Mfg. Co. 173
Koehring Co. 132
Kraft Bag Corp. 187
Kremser, Frank A., & Son..191
LaPlant-Choate Mfg. Co., Inc. 200
Leschen, A., & Sons Rope Co.144
Lift Trucks, Inc. 177
Lima Locomotive Wks., Inc.181
Lime & Hydrate Plants Co..194
Link-Belt Co. 65
Link-Belt Speeder Corp.....129
Lone Star Cement Corp.....156
McLanahan & Stone Corp..180
McLeod, Alexander T. 194
Mack Trucks, Inc. 39
Macwhyte Co. 146
Manhattan Rubber Div. ...188
Merrick Scale Mfg. Co.....144
Michigan Power Shovel Co. 38
Mid-Continent Equip. Co....192
Mine Safety Appliance Co..138
Mississippi Valley Equip. Co.192
Mixermobile Mfrs. 34
Morie, Jesse S., & Son....193
Morris Machine Works.....151
Morse Boulger Destructor Co. 182
Multiplex Conc. Mchy. Co..175
Murphy Diesel Co. 25
National Supply Co. 49
Naylor Pipe Co. 149
Neff & Fry Co. 150
New Haven Vibrator Co....186
New Holland Machine Co.. 51
Nordberg Mfg. Co. 29
Northwest Engineering Co. 5
O'Neill, A. J. 192
Osgood Co. 42
Owen Bucket Co. 188
Page Engineering Co.....150
Pennsylvania Crusher Co. 120, 121
Pioneer Engineering Works 58
Purdy Co. 190
Quaker Rubber Corp. 32
Quinn Wire & Iron Co.....176
Raybestos-Manhattan, Inc. Manhattan Rubber Div...188
Raymond Pulv. Div.....30, 31
Reiner, John ,& Co. 197
Rental Equipment Co.....189
Robins Conveyor, Inc..... 66
Robinson Air-Activated Conveyor Systems Div.....182
Roebling's, John A., Sons Co. 12
Rogers Iron Works Co..... 36
Ryerson, Joseph T., & Son, Co. 142
St. Regis Paper Co. 46, 47
Sanderson-Cyclone Drill Co.178
Sauerman Brothers, Inc....152
Schaefer's Estimating Tables 197
Schoonmaker, A. G., Co.190, 193
Schoonmaker, Robert..191, 195
Scientific Concrete Service Corp. 144
Screen Equipment Co., Inc.147
Simplicity Engineering Co..127
Sly, W. W., Mfg. Co. 119
Smidth, F. L., & Co. 55, 61
Smith Engineering Works.. 70
Smith, H. Y., Co. 190
Standard Metal Mfg. Co....184
Standard Pressed Steel Co..180
Stanhope, R. C., Inc. 193
Stephens-Adamson Mfg. Co. 6
Stone Machinery Co. 177
Stoody Co. 140
Stroh Process Steel Co.....179
Sturtevant Mill Co. 26
Superior Engines Div. 49
Syntron Co. 155
Taylor Forge & Pipe Works.130
Taylor-Wharton Iron & Steel Co. 133
Texas Co. 76
Thermoid Co. 56
Thew Shovel Co. 3
Timken Roller Bearing Co. 4
Traylor Engr. & Mfg. Co... 7
Trojan Power Co. 188
Truk-Loder Co. 187
Twin City Iron & Wire Co.186
Tyler, W. S., Co. 184
Union Pacific Railroad..... 62
Unit Crane & Shovel Corp..180
Universal Atlas Cement Co. 72
Universal Conc. Pipe Co...176
Universal Engineering Corp.123
Universal Vibr. Screen Co..153
Unverzagt, G. A., & Sons..193
Vulcan Iron Works.....125
Walsh, J. T. 195
Walsh, Richard P., Co.....196
Weiss, B. M., Co. 193, 194
Western Precipitation Corp.135
Wilfley, A. R., & Sons, Inc.184
Williams Patent Crusher & Pulv. Co. 183
Wire Rope Trading Co.....192

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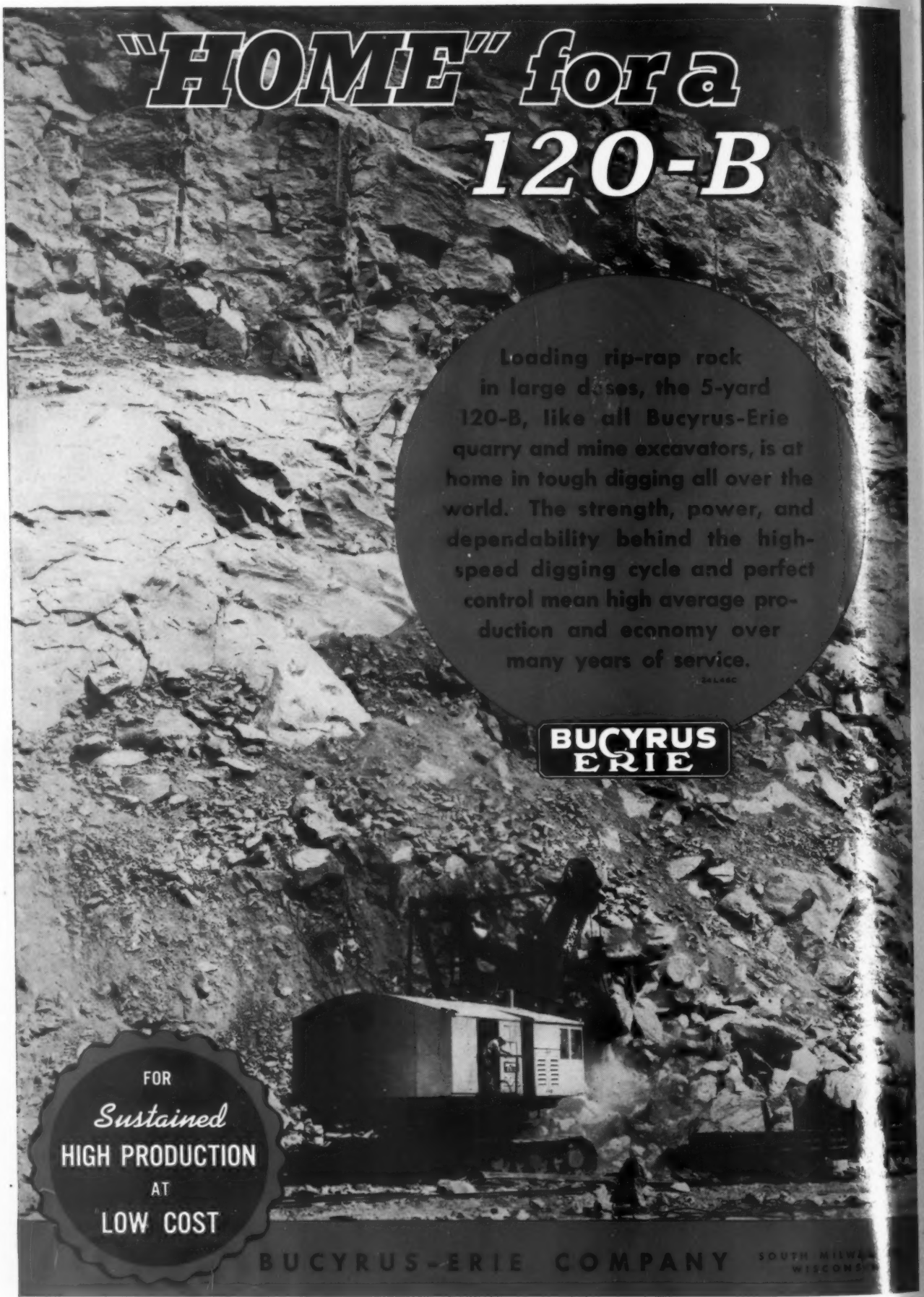
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